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China's Chief Obstruction to Industrial Expansion

The Bad Road Problem and Its Baneful Influence—A Description of China's Chief Highway

Nothing has ever been made easy for commerce in China. Chinese Governments in the past have never patronized commerce, nor thought it worth while to encourage trade. Even during the last century a living gained by internal trade was scarcely a respectable living, and participation in foreign commerce was little short of treason. So trade has grown in spite of the Chinese Government's neglect and is enjoying now little more than a begrudged recognition. No assistance worth mentioning is given either the manufacturer or the shipper, and enterprises of a commercial sort never really arouse official interest until they promise large yields in the form of taxes. And the taxes that a merchant pays, purchase for him the nominal protection of soldiers who loot him more often than they protect him, official recognition that takes the form of extortion, and revenue offices on every highway, which cut off his trade in many commodities with all but his immediate neighbors.

The least that a government can return to the trader in exchange for the taxes he pays is the provision of a means of transportation. China has made less provision for transportation than any civilized country on earth.

Where roads have been built and canals dug that have been useful to the trading population, it will be found that their construction was prompted by the whim of an emperor, or for the movement of troops, army supplies, or imperial tribute. It only happened that these highways served trade at the same time. The canals, which were later incorporated in the Grand Canal, were first dug so that a monarch could travel in his pleasure boat from Honan to Hangchow in Chekiang. This system was improved upon so that the Mongol capital could be kept in rice.

The big roads running east and west across China were built for the movements of troops, and were never repaired or improved upon in times of peace. Soldiers guarded them so that officials and official messengers could travel in peace, not to protect merchants. Wherever merchants traveled in numbers, taxes were levied, the soldiers practiced extortion, and the merchants hunted byways so that they could escape traveling on the Imperial roads.

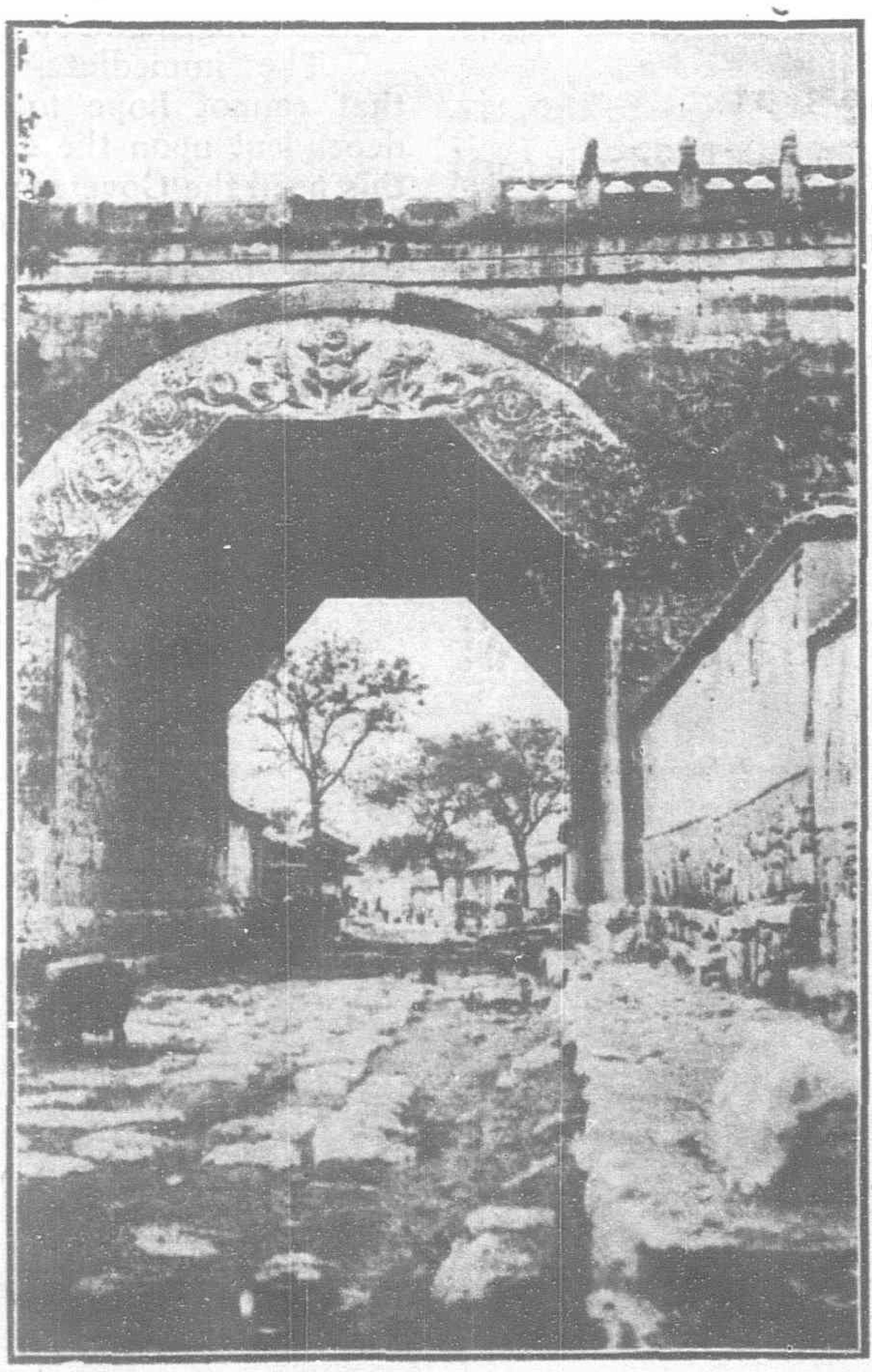
Except in the vicinity of foreign settlements, near railway stations, and in a few semi-modern cities, there is no road in China upon which an Occidental vehicle could make a day's journey without suffering permanent injury.

China's total length of railways, after forty years of building would not make a double track across the country.

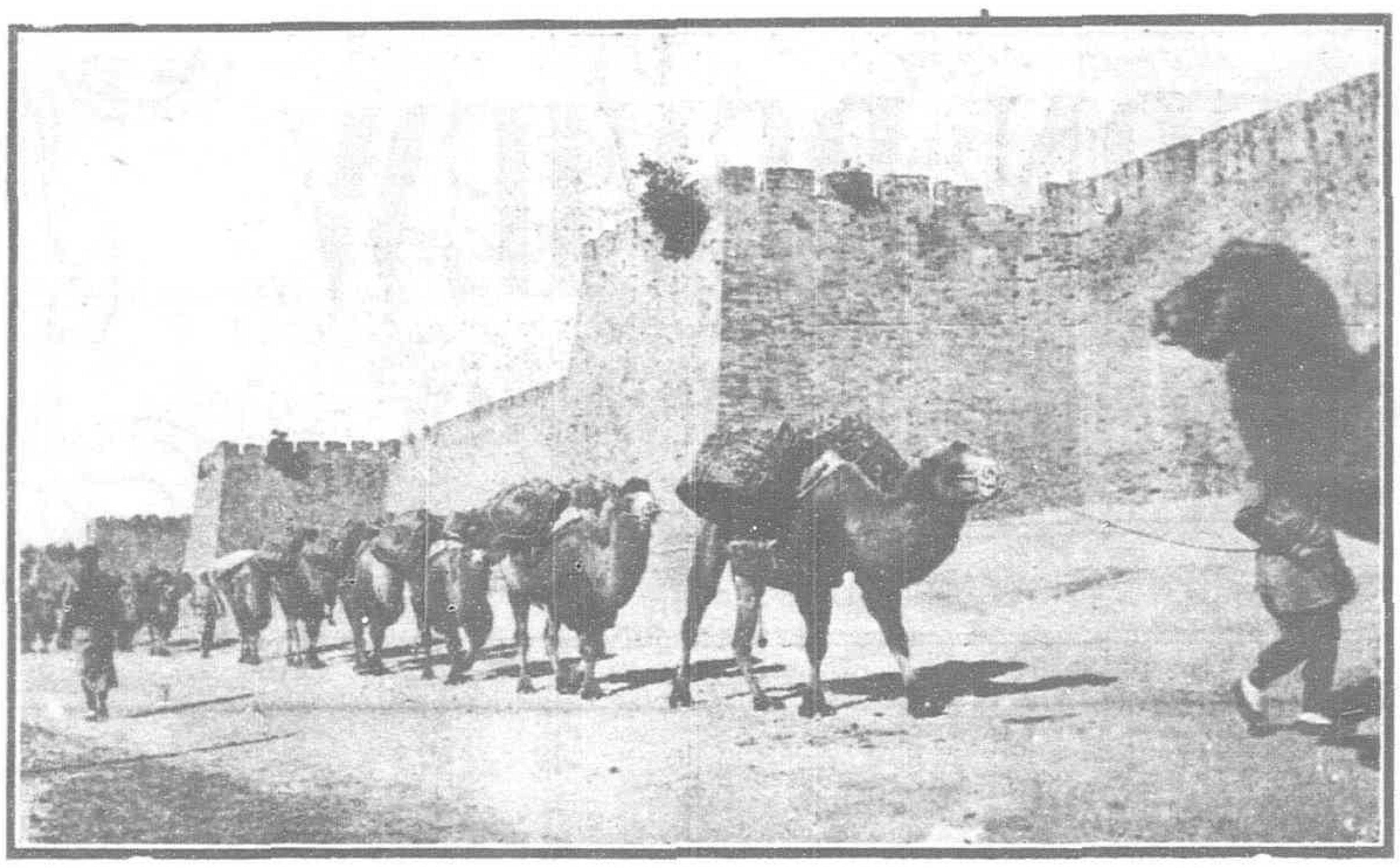
There are only two lakes and two rivers that are navigable for more than a few miles to any craft bigger than steam launches and junks, and for these natural highways the Government is not responsible.

The great bulk of the interior traffic from province to province and from the interior to the coast is carried in little boats through ill-kept drainage and irrigation canals, in massive and unwieldy carts, on wheelbarrows, on mules, donkeys, camels, and other beasts, and on the backs of men and women.

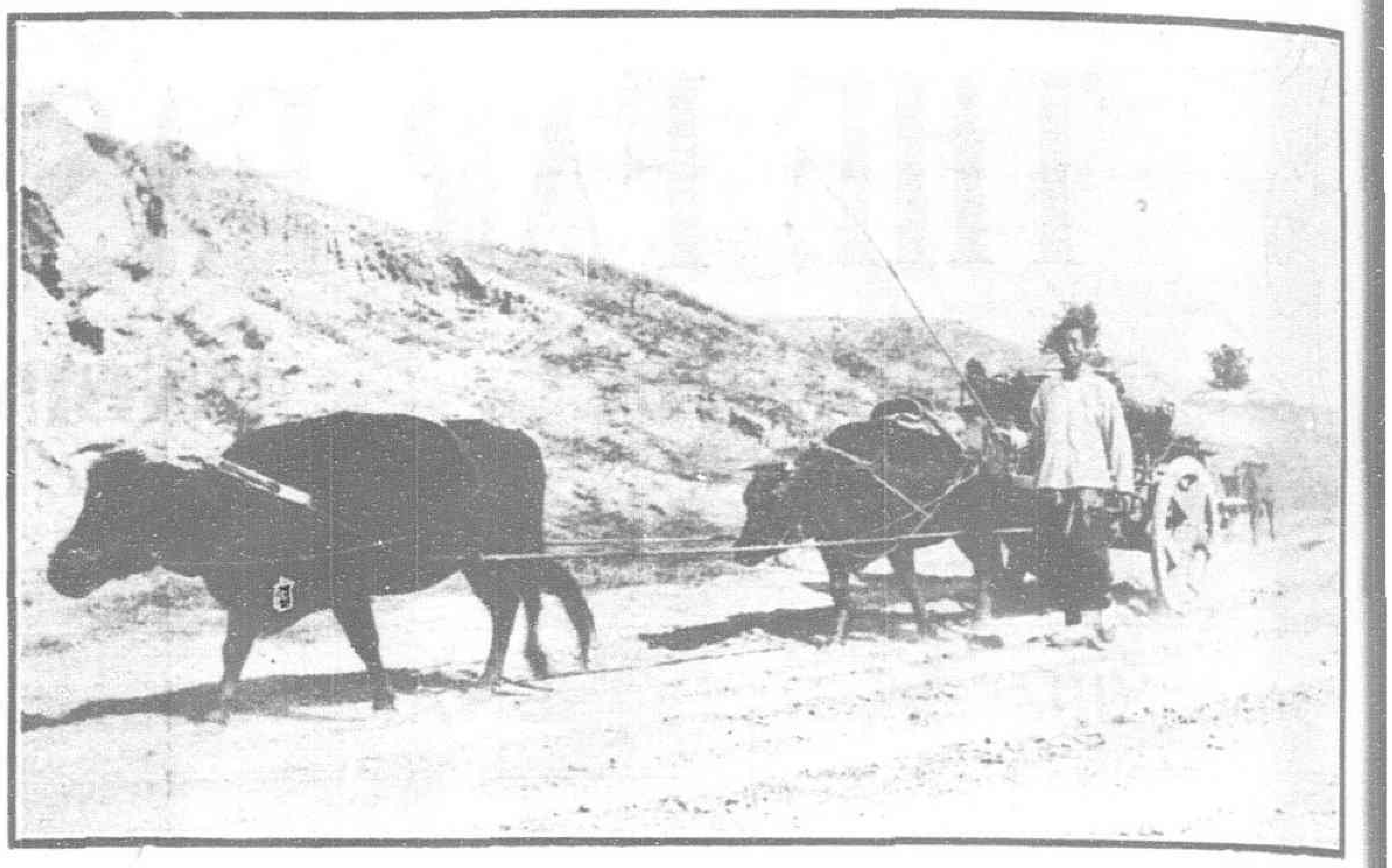
The products that are brought from the remote provinces to the



A FAMOUS GATE IN THE NANKAO PASS ON THE "IMPERIAL" ROAD FROM PEKING TO URGA, THE CAPITAL OF MONGOLIA



Camels Arriving at Peking with Farm Products



A Cart in Northern Chihli

railways and the seaports for export are dragged painfully for hundreds or even thousands of miles over the worst roads on earth at an average speed of twenty-five miles a day, are taxed heavily wherever they go, and are finally sold at prices low enough to make competition in European and American markets possible. It is amazing that it can be done at all. It is also evident that as the standard of living improves, as wages go up, as grain for both men and beasts increase in cost, it will be quite impossible, and that the time is coming when the provinces and districts without waterways and without railways will be cut off altogether, when communications must cease and the natives resign themselves to a barbarous isolation. While this dismal state of affairs is still in the future the Chinese Government might be building roads and digging out waterways, but it is not.

The time and labor lost and the money spent in transporting Chinese products over Chinese roads cannot be estimated. Most of the wool that is shipped from Tientsin, for instance, travels fifty days overland.

Variable Cost of Transport

Carts and mules average about twenty-five miles a day in good weather. In bad weather they do not do so well, and when the roads become impassable, that frequently happens, they do not travel at all.

Camels average twenty miles a day.

A Chinese cart, pulled by three or four mules, will haul 1,000 catties.

A camel carries 300 catties, a mule 240, a donkey 120, and a man anywhere from 60 to 300 catties. A catty equals a pound and a third.

The cost of transport varies a great deal. Along the coast it is higher than in the interior. In bad weather it is higher than in good weather. In the mountains it is higher than in the plains, and the rates vary with the demand.

In the writer's experience, in many parts of China and under various conditions, the average costs of moving goods overland have been the following:

Carts carrying 1000 catties, Tls. 2.00 per day, or Tls. 0.08 per mile per thousand catties. Mules carrying 240 catties, Tls. 0.45 per day, or about Tls. 0.08 per mile per thousand catties.

Camels carrying 300 catties, Tls. 0.30 per day, or about Tls. 0.05 per mile per thousand catties.

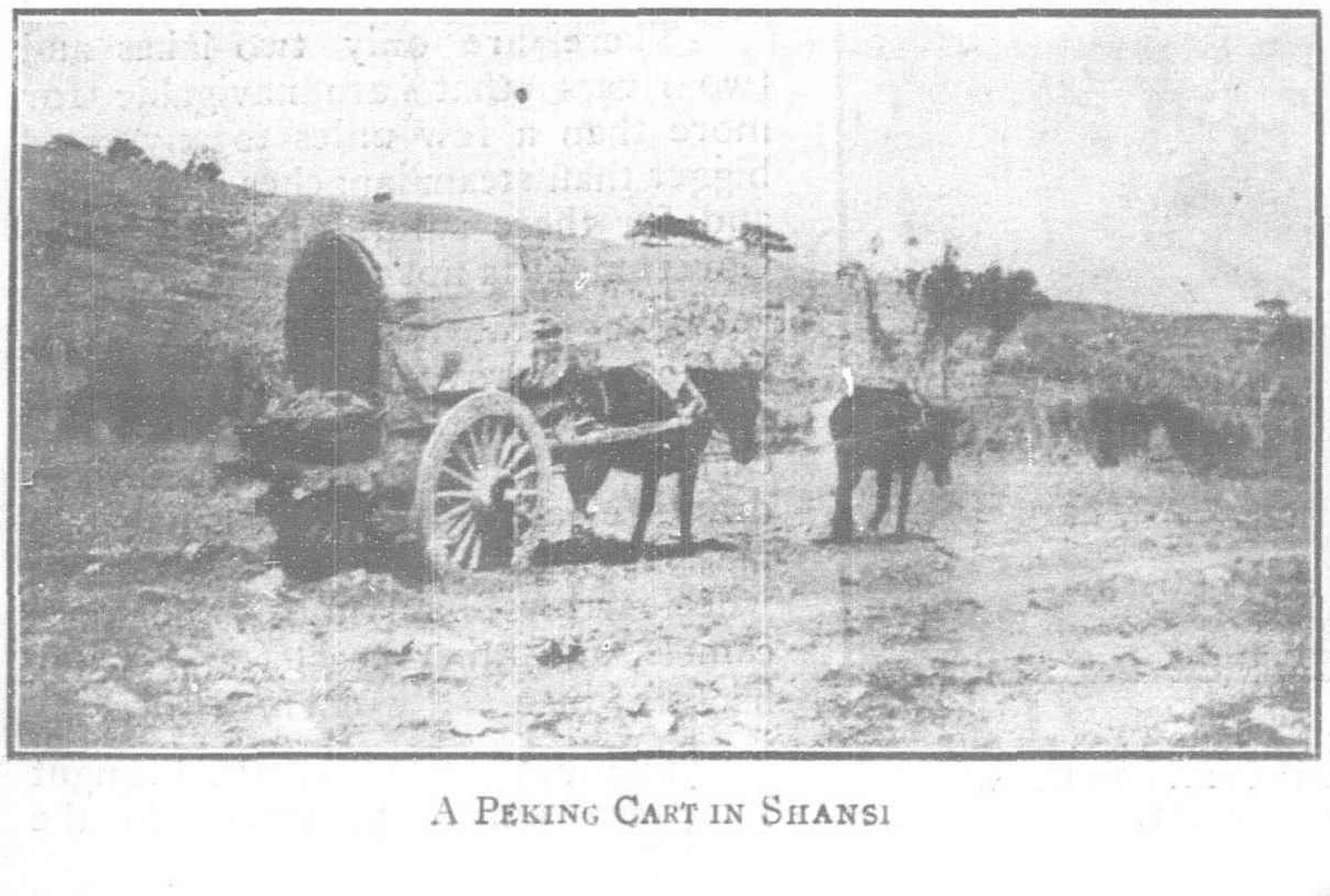
The cost of shipping goods by junks over inland waterways also varies greatly, but at the most is only a fraction of the lowest possible rate over Chinese roads. The provinces with networks of streams and canals, which have to be kept in some sort of order by the authorities to cope with floods, therefore do a much better trade with the outside world than the mountainous districts of the north and west, in which the lack of roads discourages all commerce except that which yields sufficient profit to cover the heavy cost of transport over the rutted sloughs and stone heaps that serve as highways.

The immediate future of a great deal of north China that cannot hope to have railways for a generation or so is dependent upon the construction of modern roads, but to meet this need the Government is doing absolutely nothing.

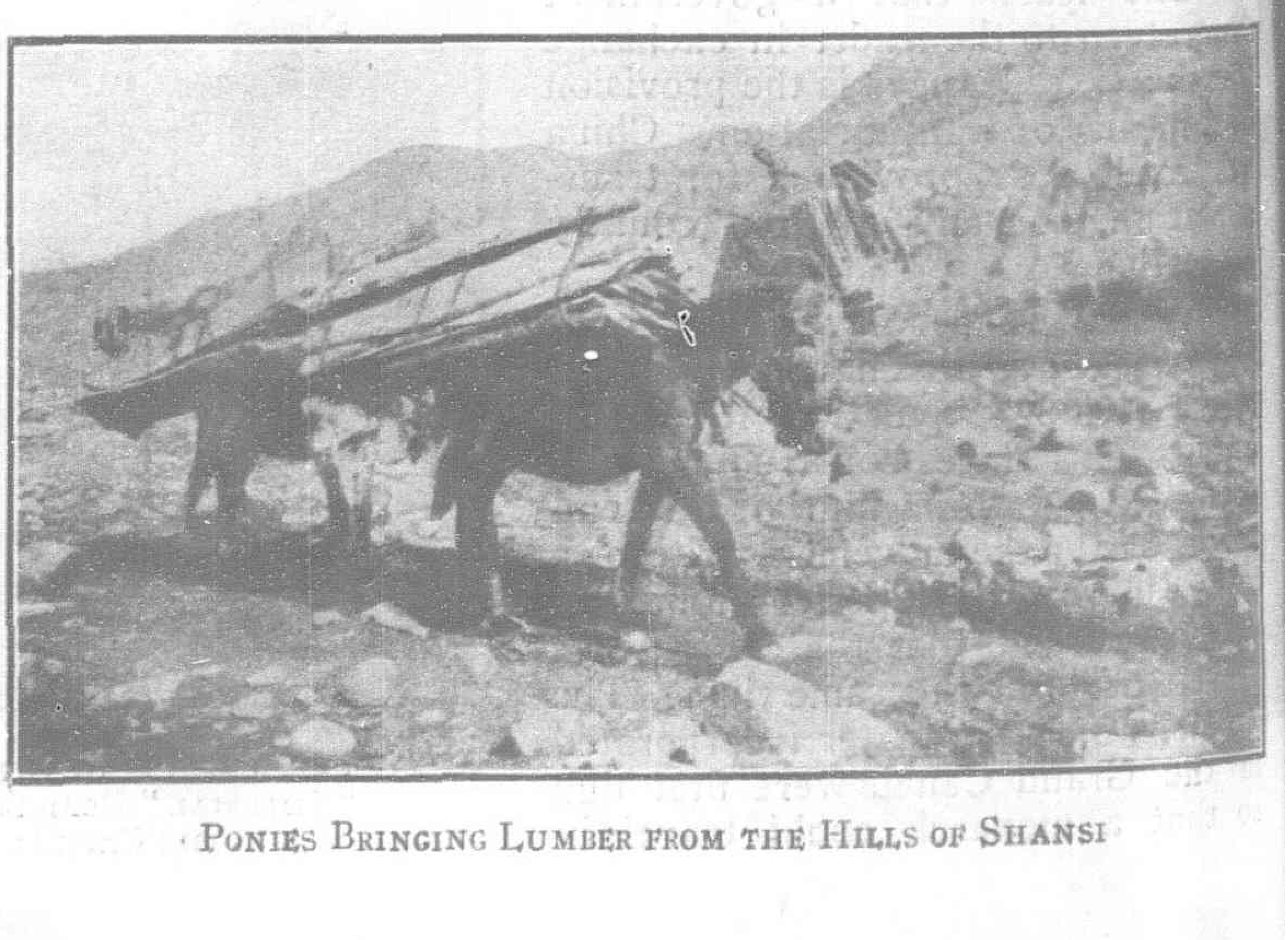
It is safe to say that the grain that keeps four mules in condition to pull a Chinese cart over a Chinese road would be sufficient to feed those same four animals pulling five times the load in modern vehicles over modern roads. And this would not only mean that five times the business could be done at the same cost, but that the reduced expense would make it possible for fifty times the business to be done in commodities that it does not now pay to haul at all. This the Chinese Government has not yet grasped.

Farmers Forced to Repair Roads

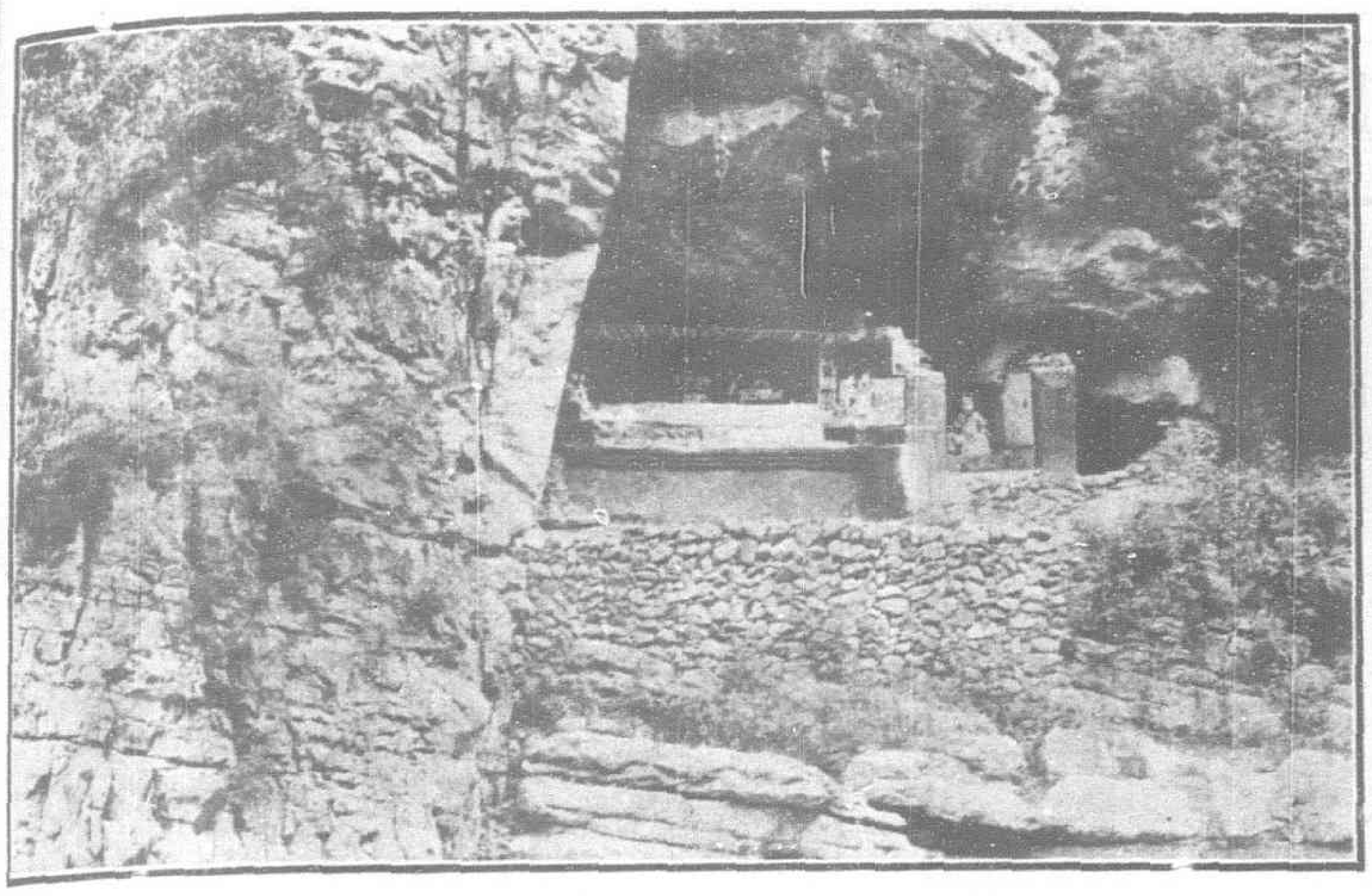
Roads are put in condition by the country folk when they can no longer be used, and when there is no way around.



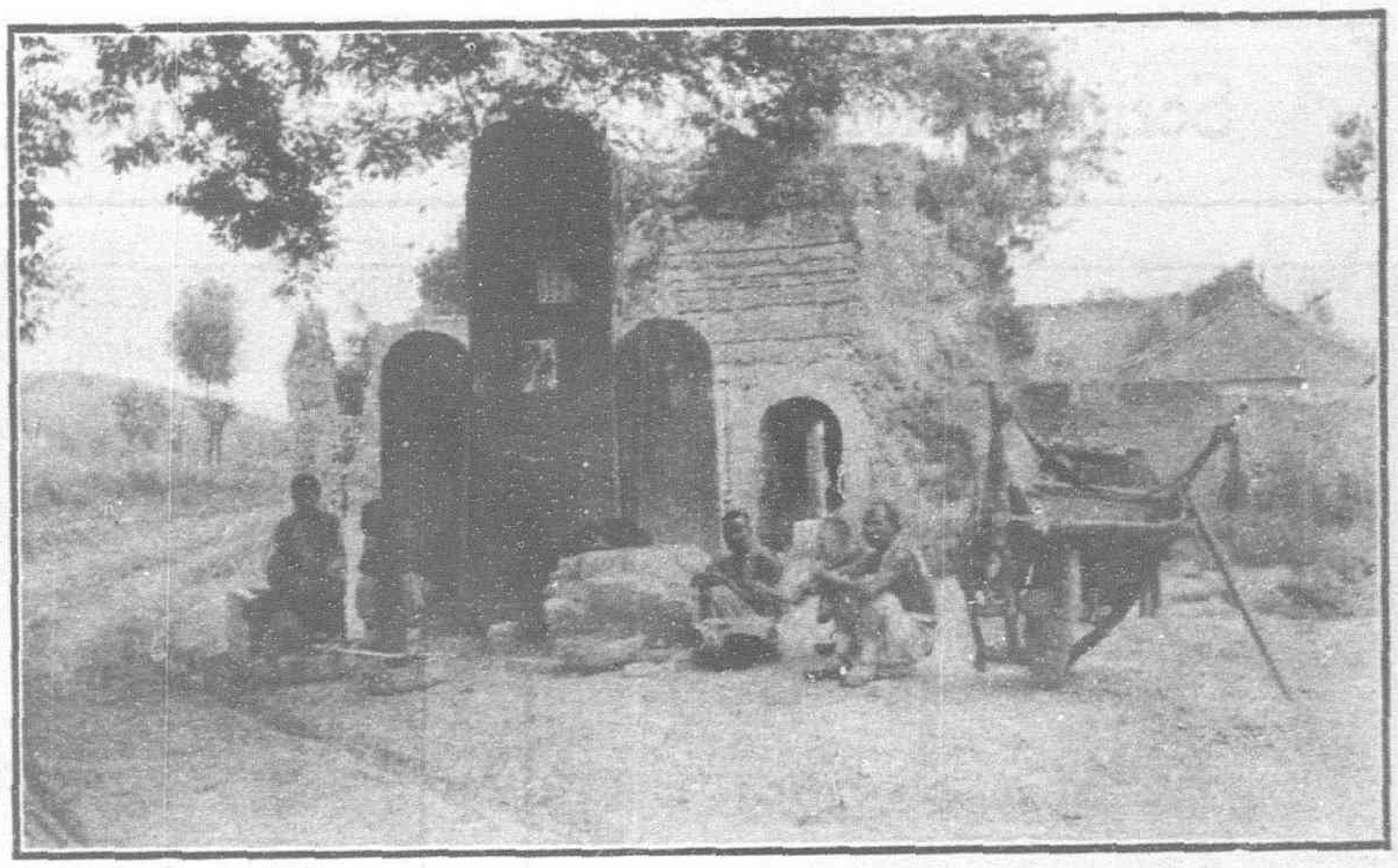
A Peking Cart in Shansi



Ponies Bringing Lumber from the Hills of Shansi



Roadside Shrine in the Tienling Mountains, Shensi



Wei Basin, Shensi. Wheelbarrow Coolies at Siesta

Canals are dredged when floods have done irreparable damage and the need of adequate drainage is emphasized by the extinction of whole communities.

In the case of the Grand Canal, the Government has been persuaded to carry on extensive dredging, dyking, and reclamation work and has given the contract to an American firm, while the funds were to have been supplied by American financiers, but for one reason or another—for which the Government in this case is not entirely to blame—no beginning has been made. Railways, for which the concessions have been granted either many months or many years,—again for which the Government is not to blame,—are not pushed through, and the communications of the country, which is just beginning to aspire to a foreign trade, become more and more inadequate as the cost of living and the standard of living go up. Many Chinese aspire to assist the Allies economically in the war, but they lack the industries, and worst of all they lack the communications through which these industries could be fed and their output shipped. The duty of the Government is to build roads. The labor is available, and so is the money. Railways may not be built extensively at this period of world war because of the high cost of materials, but for road making everything is available in the country. To employ the soldiers would be to kill two birds with one stone. Decent highways would be made to facilitate trade, and the soldier nuisance, the curse of the country, would be solved.

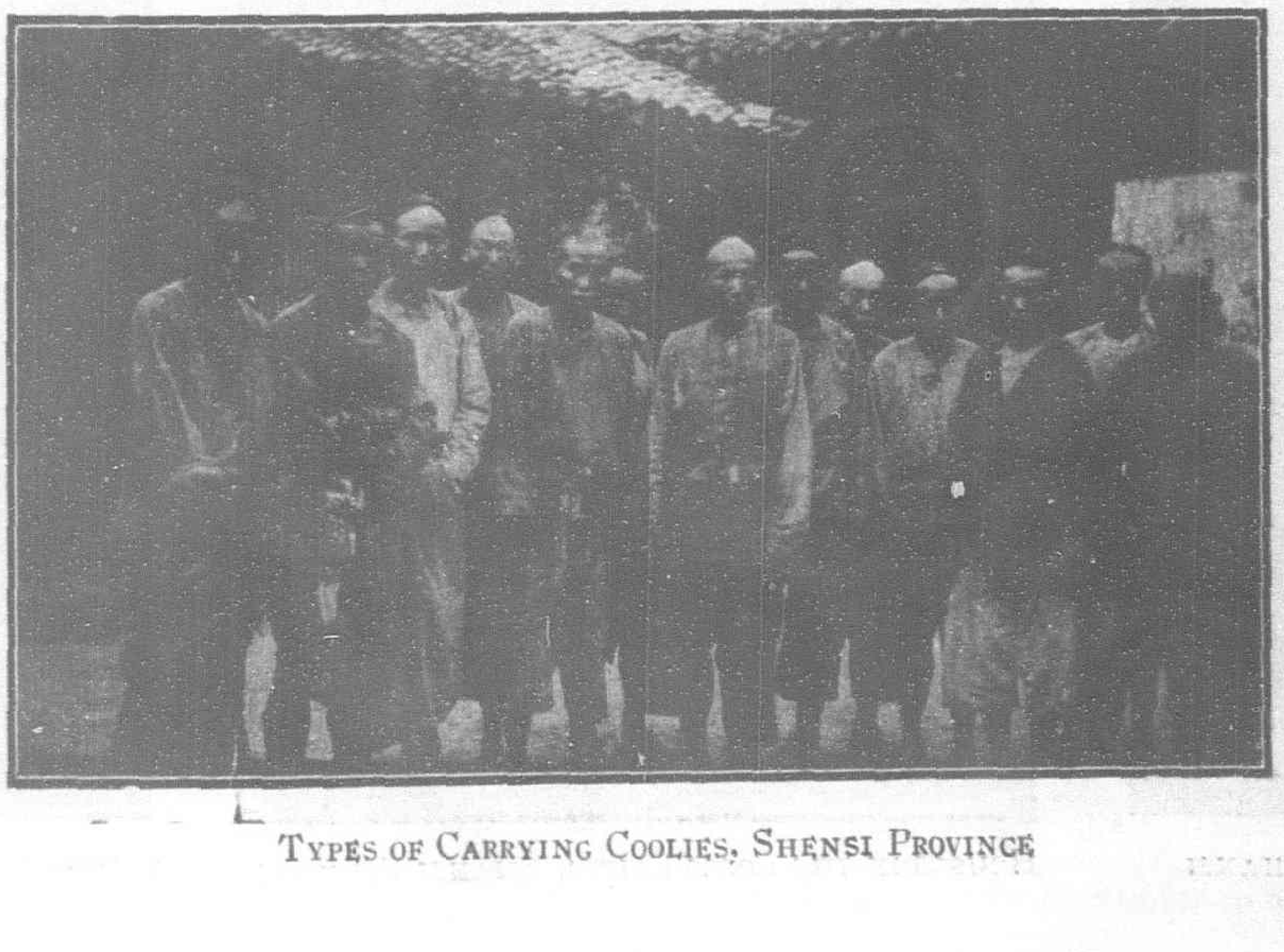
China's Greatest Public Highway

Mr. Julean H. Arnold, the energetic and observant American Commercial Attaché, wrote an excellent and informative description of the Great Western Highway of China, and we republish it because it will give the reader some general idea of the conditions obtaining throughout China where there are no waterways.

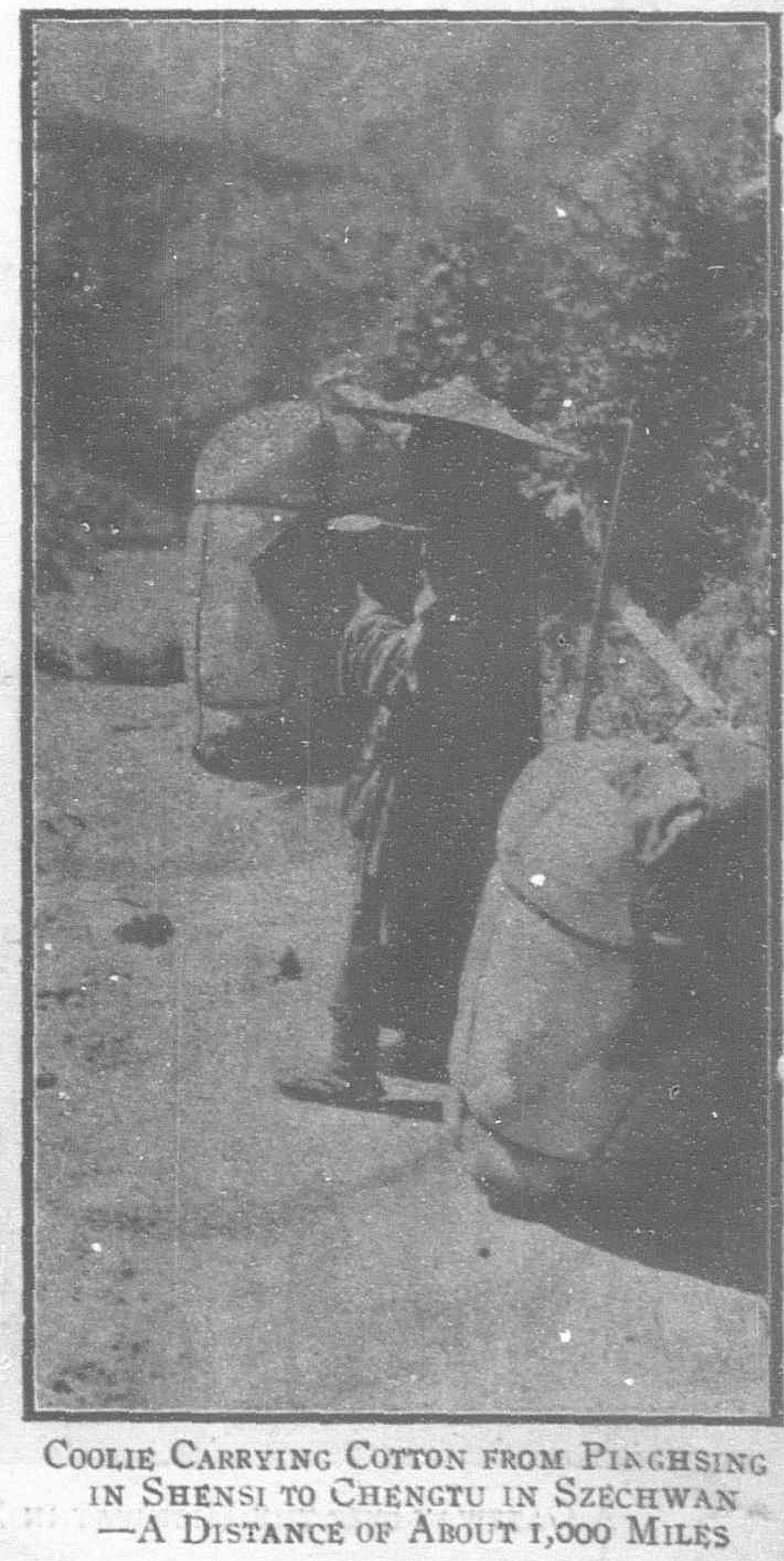
It is in northwest China that we find overland traffic most general, writes Mr. Arnold, for in this section of the country there are no navigable streams. It is here that we also find the methods of transportation the most primitive. In fact, a Westerner walking along the roads in this portion of the country might easily imagine himself in medieval Europe. Nowhere can he secure a better illustration of what the absence of modern science and invention may mean to a civilized people than here in west China.

The northwestern provinces are traversed by the Great Western Highway, described in Szechwan as the Great North Road. This is the greatest public highway in all China. It extends from Peking southwest through Shansi and Shensi provinces to Chengtu, the capital of Szechwan. In Shensi, it serves as a link connecting the Wei Basin, Kansu province and Eastern Turkestan with east China; in the valley of the Upper Han it has a river outlet to Hankow; at Chengtu it connects with roads leading to Tibet, and to Chungking and Wanhsien

rrying Coolies, Southern Shensi and Szechwan

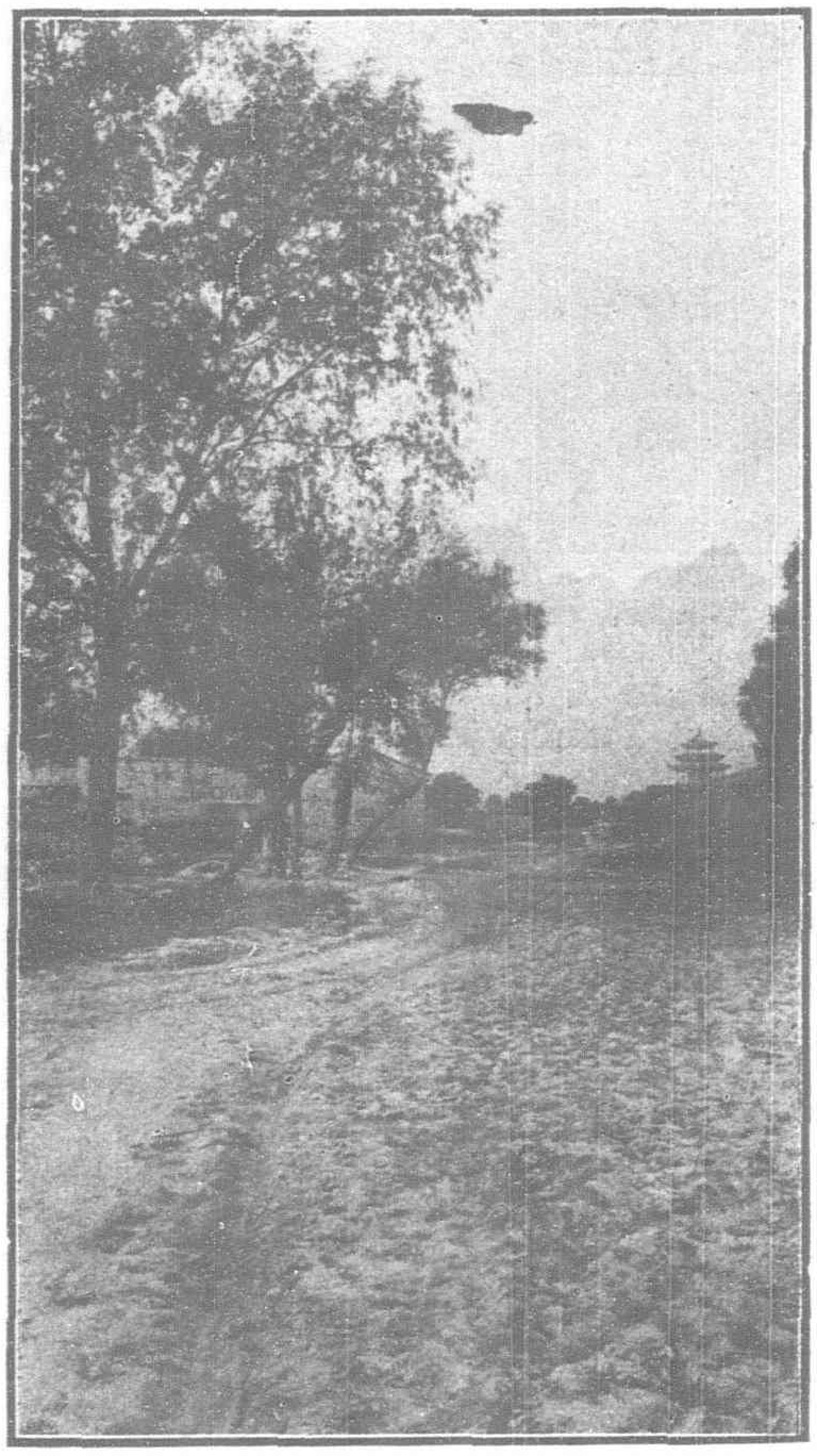


Types of Carrying Coolies, Shensi Province



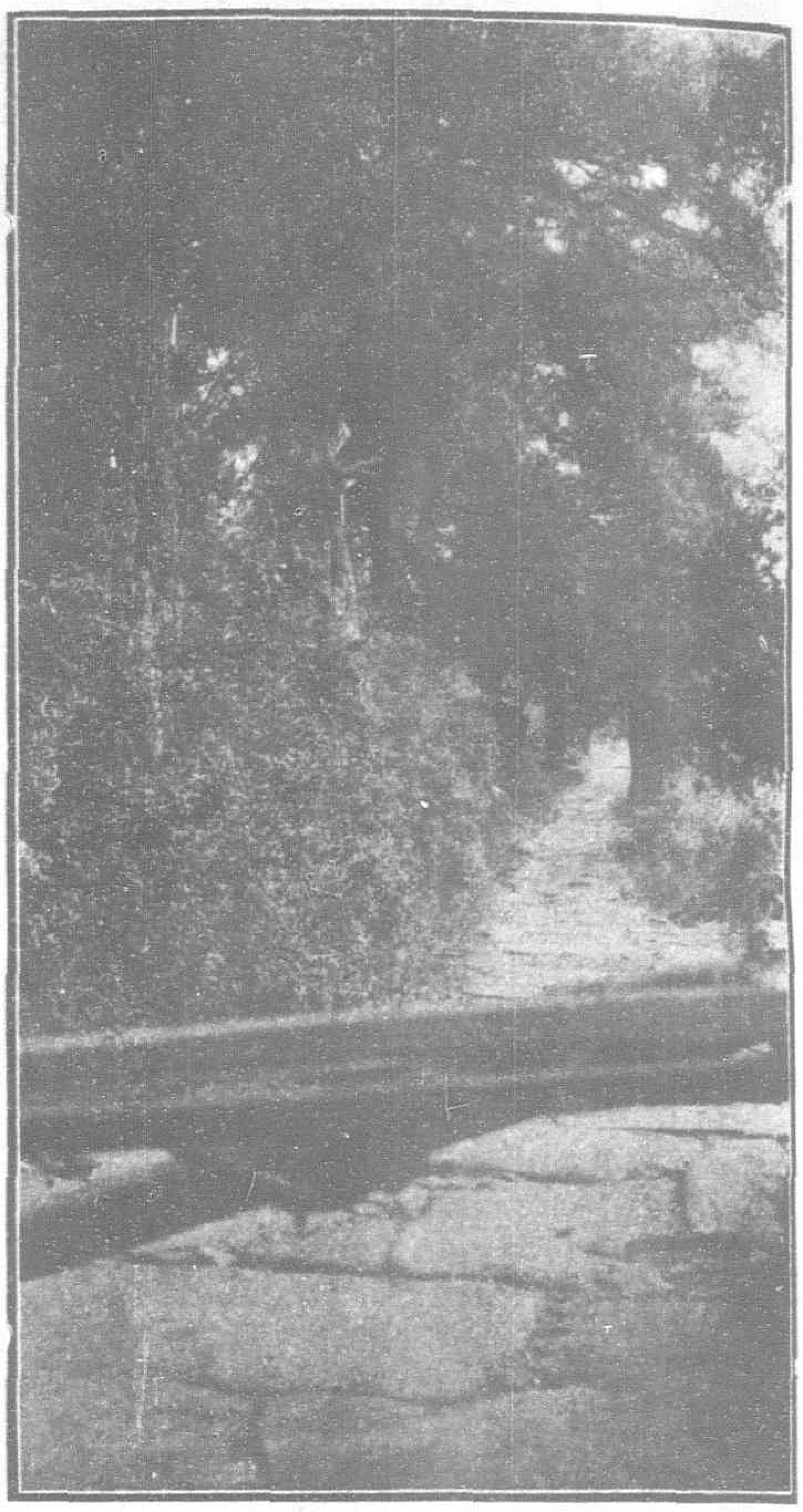
Coolie Carrying Cotton from Pinghsing in Shensi to Chengtu in Szechwan—A Distance of About 1,000 Miles

Scenes Along the Highway Through Shansi and Shensi into Szechwan

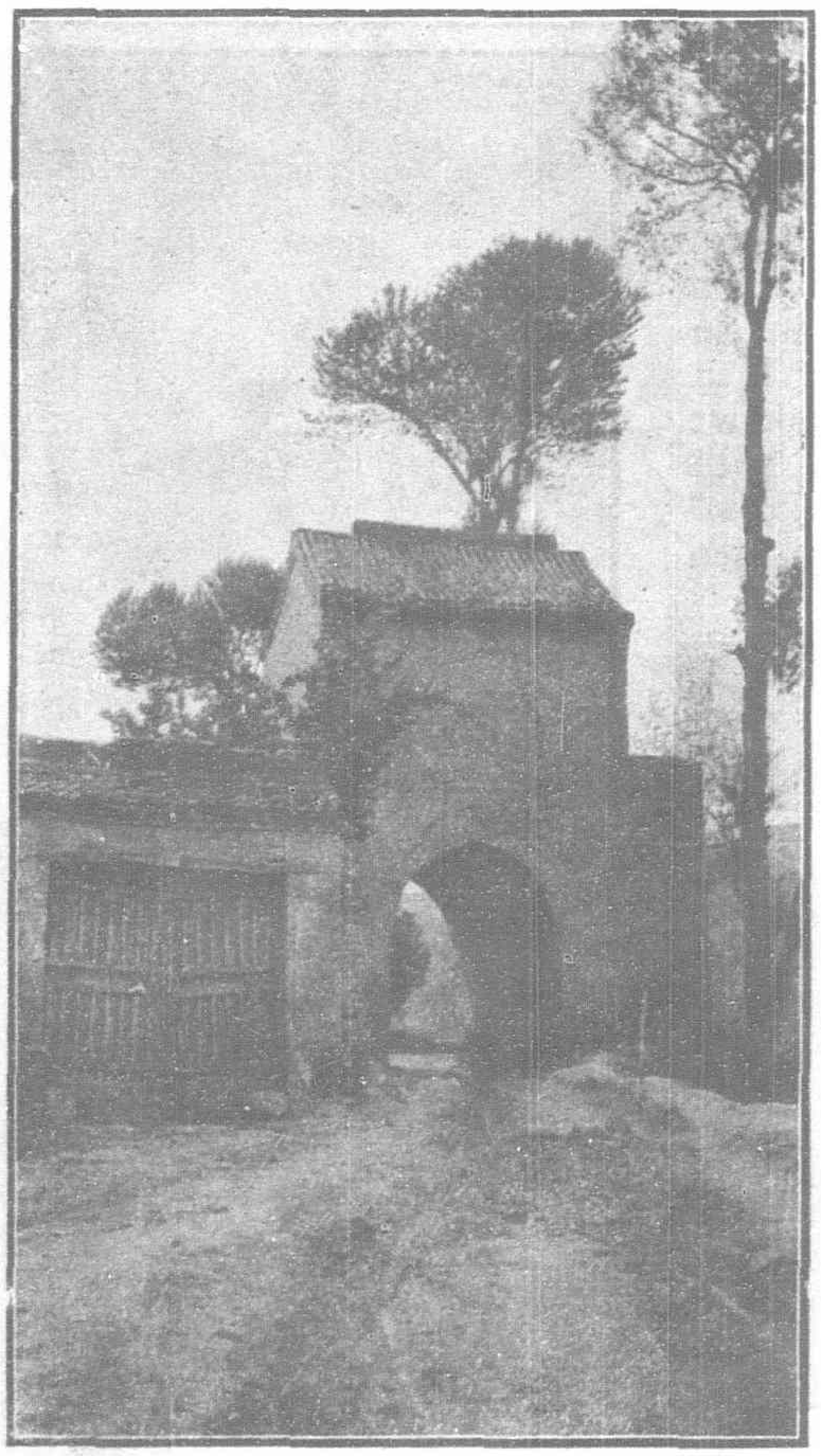


WHERE THE HIGHWAY IS WIDE IN SHENSI

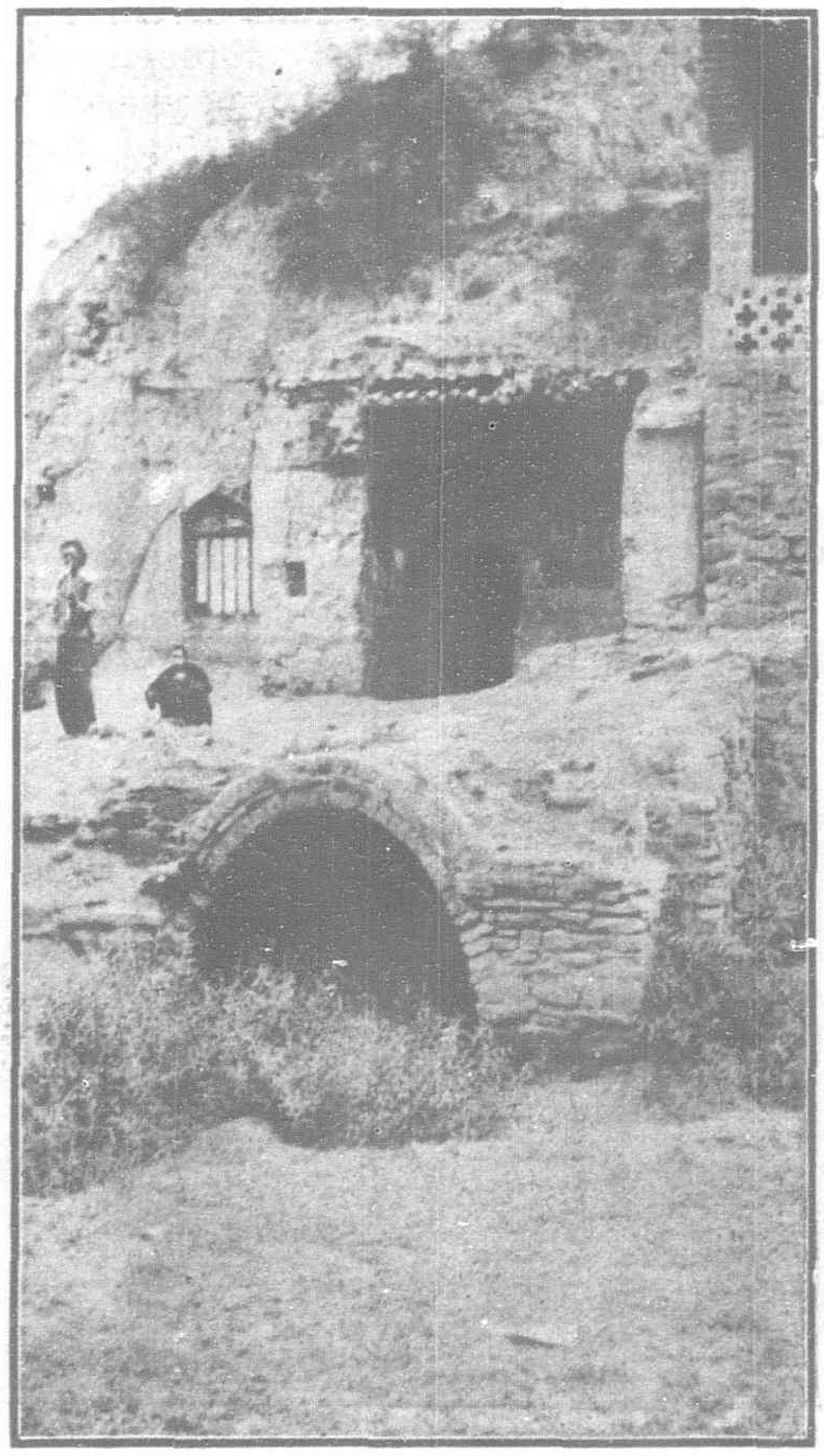
A SEDAN CHAIR ON A PASS OVER WHICH THE HIGHWAY RUNS IN SHENSI



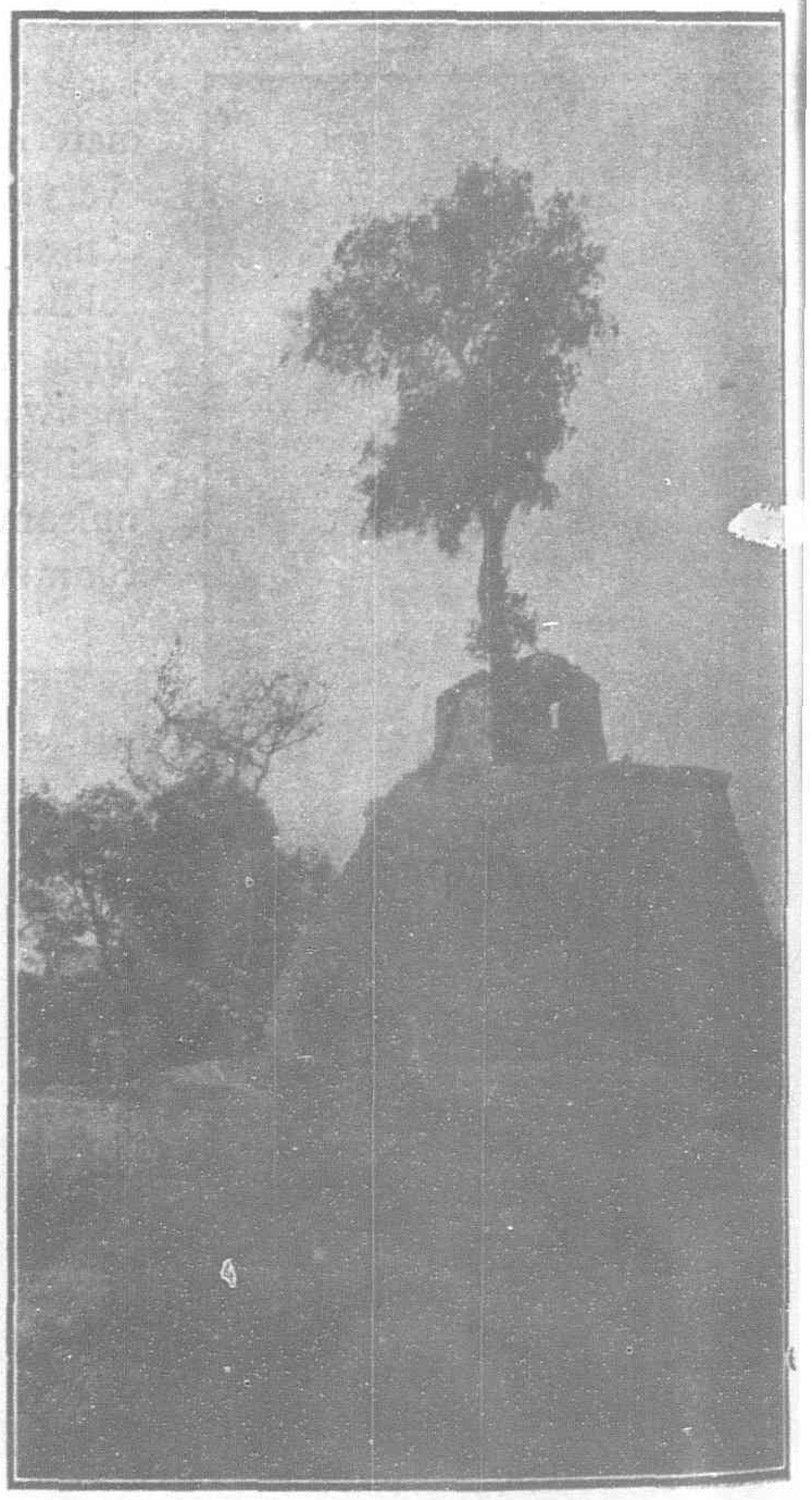
THE CEDAR-LINED HIGHWAY IN SZECHWAN PROVINCE



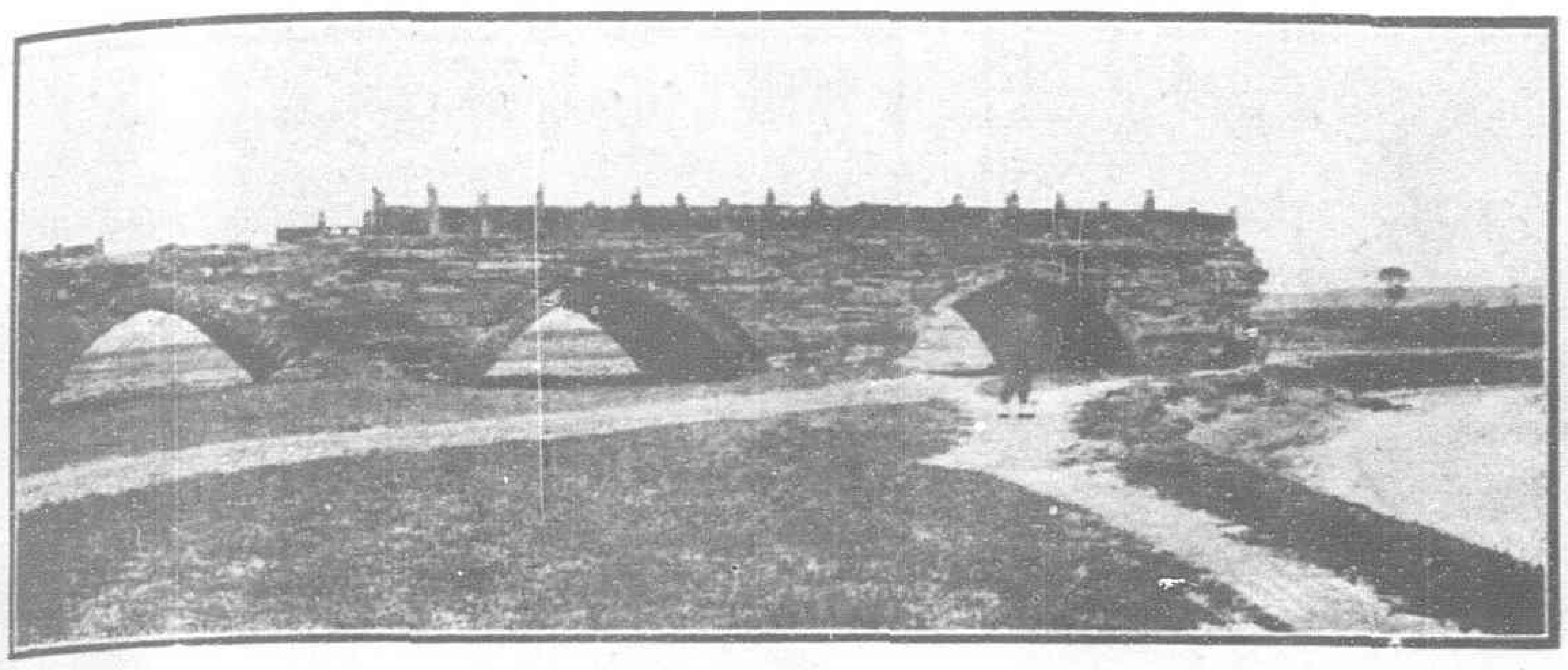
A GATEWAY OVER THE HIGHWAY IN SHANSI



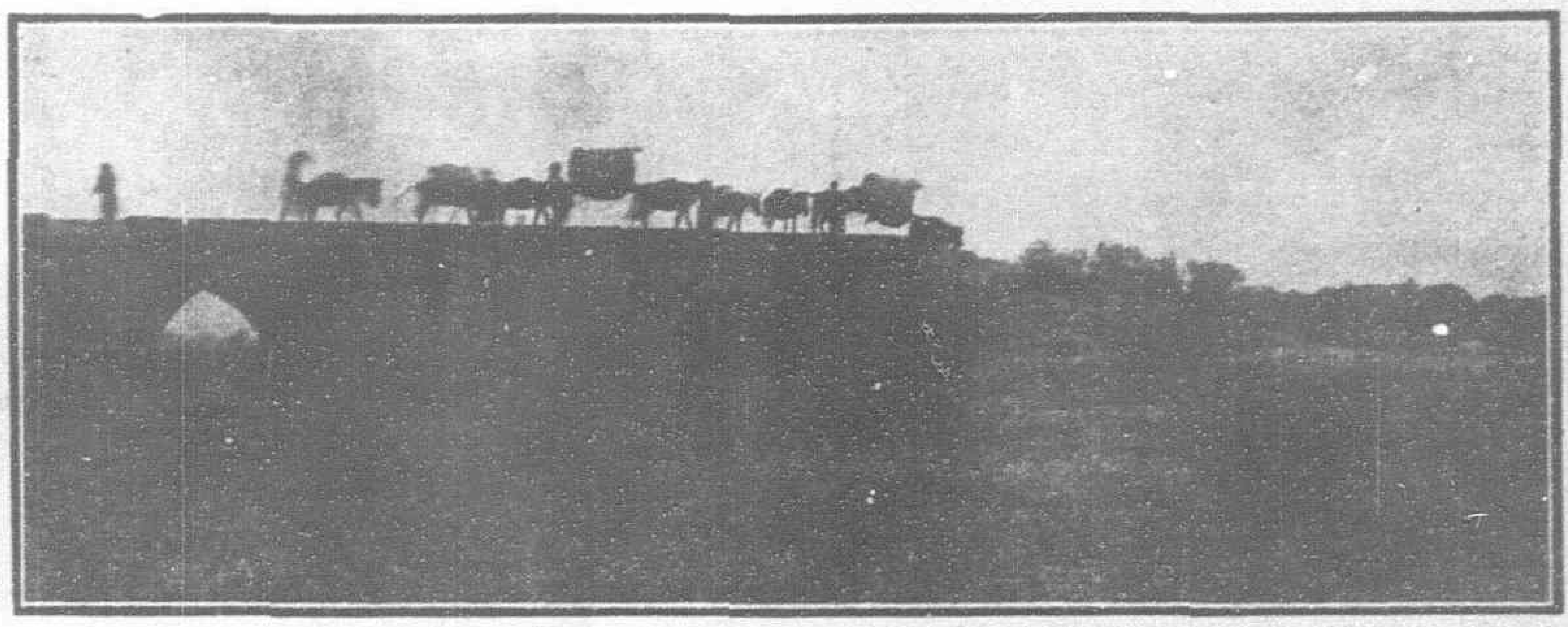
HOUSES IN THE LOESS CLIFFS, SHANSI PROVINCE



AN OLD WATCHTOWER ON THE ROAD TO SZECHWAN



SILTED STREAMS, THE RESULT OF DEFORESTATION IN SHANSI. WHERE SOIL FROM THE UPLANDS NOW FILLS THE VALLEYS SUBJECTED TO ANNUAL FLOODS



MULE LITTERS CROSSING A BRIDGE WHICH STANDS APPARENTLY IN THE MIDDLE OF A WHEAT FIELD. THE RIVER IT ONCE CROSSED HAS BEEN SILTED UP

on the Yangtze. In addition to these there are a number of minor ramifications. It may safely be said that this great road serves a population equal to that of the whole United States.

Strategic Road 2,000 Years Old

As a section of this highway traverses that portion of China known as the cradle of the Chinese race, it is more than likely that the greater portion of the road is more than 2,000 years old. We know that it was originally constructed for strategic purposes, and that after Peking became the capital it served to keep the outlying provinces in touch therewith. Ancient signal towers still stand along the portions of this road between Peking and Fengsiangfu on the western border of Shensi. These, known as ten li towers (supposed to be ten li, or three miles apart) served to transmit by firelight or smoke messages and news concerning rebellions and other important events to Peking. The road has also served for conveying tribute grain from the districts which it takes to the capital. Although there are still a number of fortresses along this highway, of which that at Tungkwan, the entrance to the Wei Basin, in northern Shensi, is the most conspicuous, yet the road is used to-day more as an avenue for commerce and trade than for any other purpose.

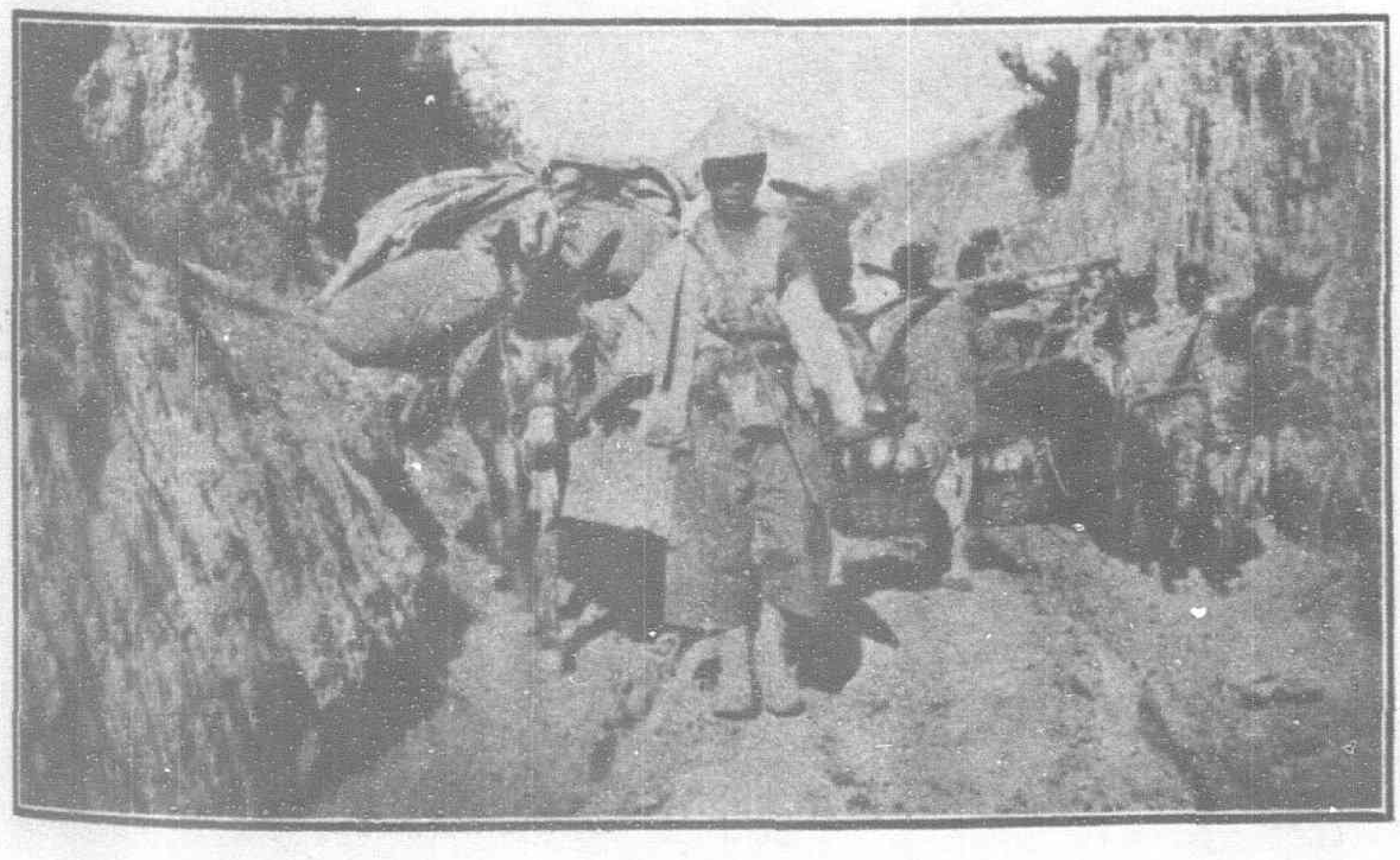
As Peking is now connected by rail with Taiyuanfu, the capital of Shansi province, this paper will be confined to describing that part of the Great Western Highway between Taiyuanfu and Chengtu, a distance of 1,200 miles. The road is naturally divided into two nearly equal sections, the point of division being at Fengsiangfu. The northern section is essentially a cart road, and carrying coolies are not seen. It is not entirely due to the rugged mountainous character of the southern half of the road that wheeled vehicles are not in use on this section, for even when the numerous mountain passes are crossed, and the densely populated, expansive Chengtu plain is reached, where one might again expect to see the cart, there are none, for we have here the rice field of South China.

The paddy field of the South calls, not for the horse and the mule, as does the wheat field of the north, but for the water buffalo. If mules and horses cannot be used in farming operations, one cannot afford to keep them merely for transport, so with the rice field wheeled vehicles vanish. The narrow, stone-paved road replaces the broad, dirty highway, and man becomes the principal beast of burden. The road becomes lined with rest stations and refreshment houses. The inns are for men rather than for beasts. The gauge of the city streets approximates that of the country road, for in the absence of railways the general transportation system must be uniform. Thus in the cities of the rice-producing sections we find the main streets generally narrowed to a width permitting the passing of two sedan chairs, whereas in the cities of the non-rice-producing sections, the limit is a width which will permit the passing of two broad-gauged carts with a path for pedestrians on each side. In the rice-producing sections, the country roads are paved with flagstones, for, being lined on both sides with paddy fields, it would be impossible, in case they became impassable in bad weather, to switch the traffic off on to the rice fields, which are generally under water. In the non-rice-producing sections, except in the cities, flagstones are not necessary. When the roads here become impassable, it is generally possible to switch the traffic on to the fields, for there are in China no fences or hedges protecting the fields from the roads.

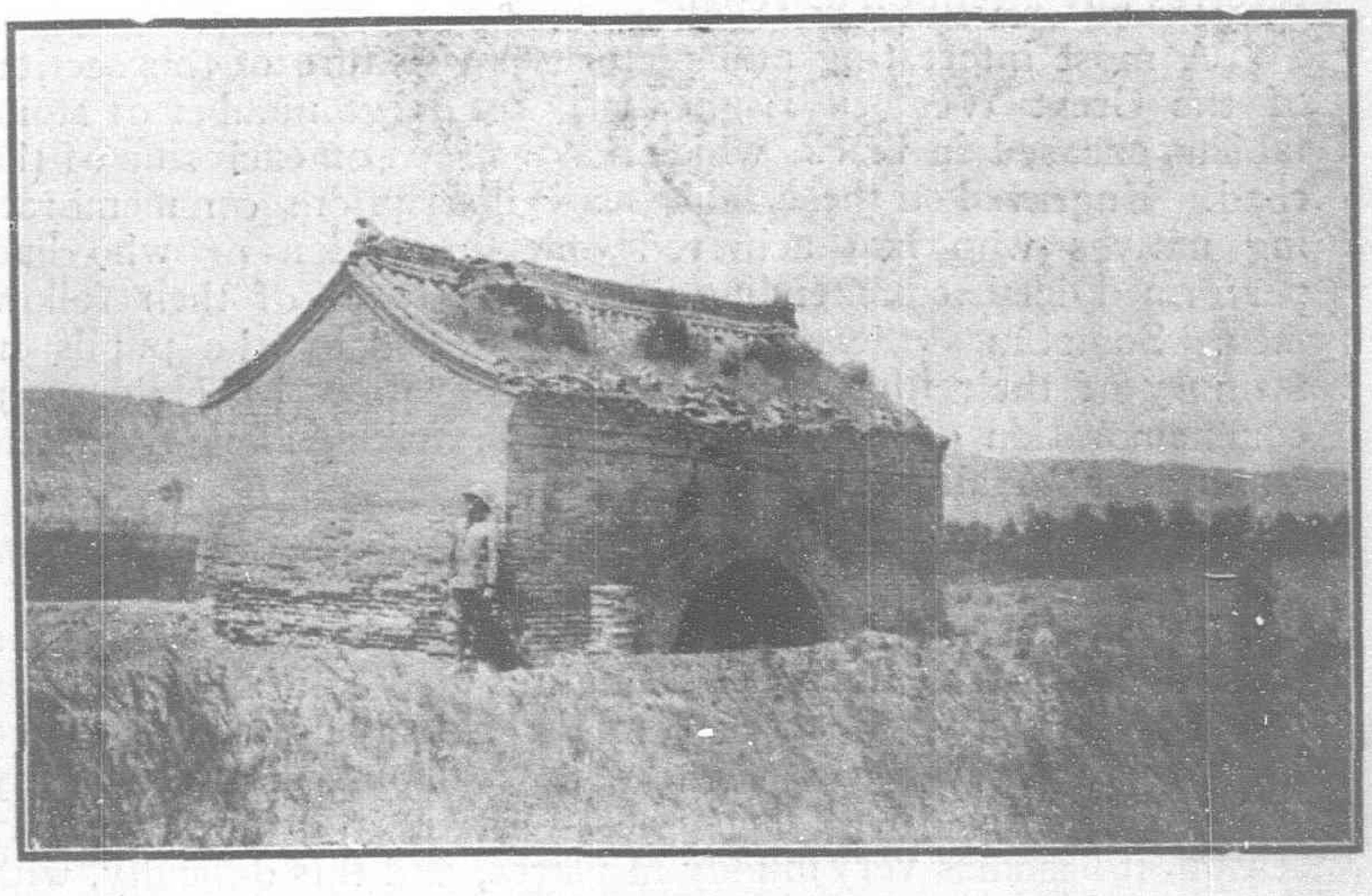
From Taiyuanfu through southwestern Shansi, the Great Western Highway follows the course of the Fen River, crossing the Yellow River at Tungkwan, whence it takes its way along the Wei River, which, like the Fen, is a tributary of the Yellow River.

Road Through Loess Canyons

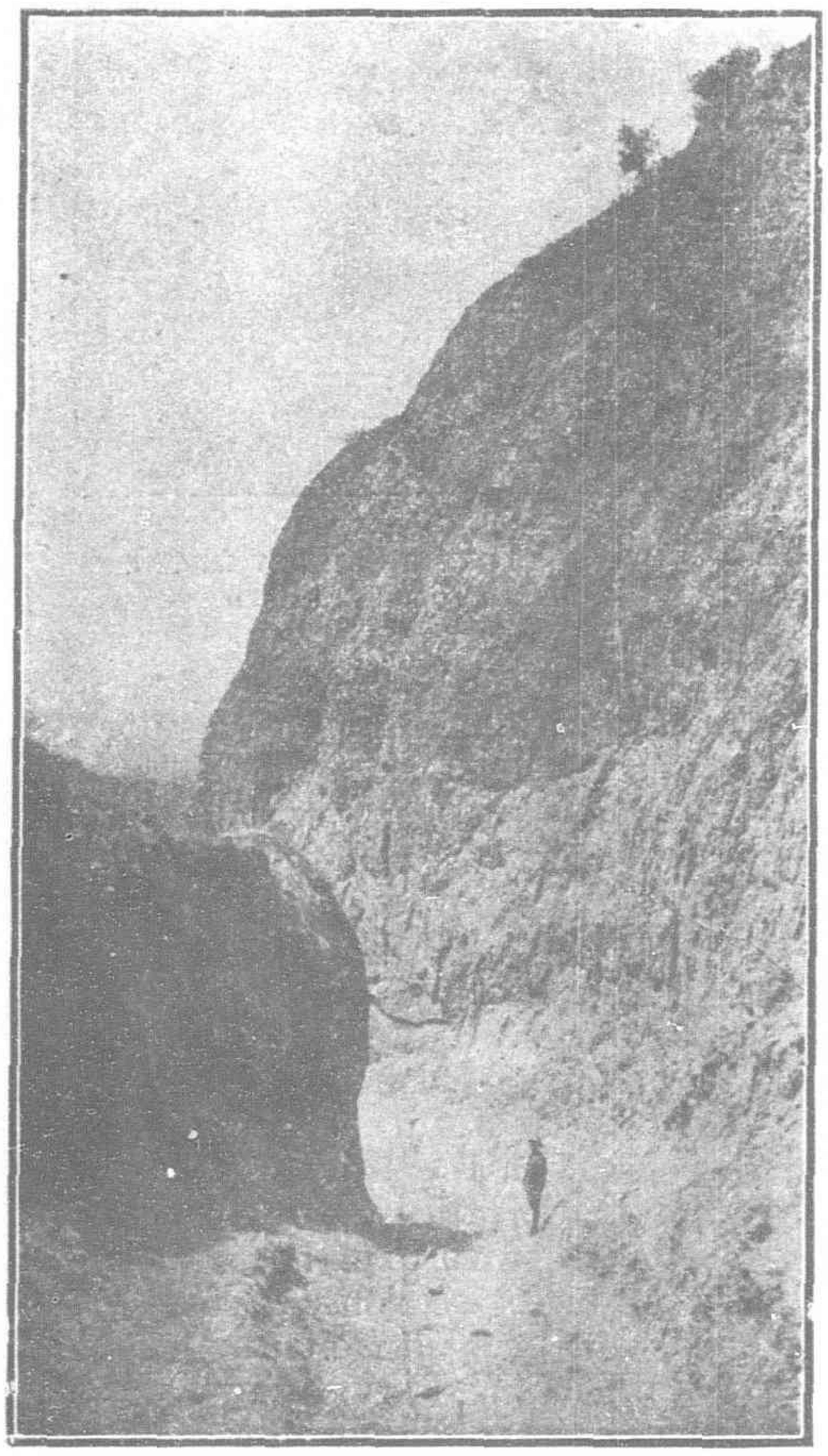
The entire length of this section of the highway is in the loess belt. The loess is a brownish-yellow loam which, in its natural state, is solid but is easily reduced to a fine powder by crushing it in one's hands, hence it does not make good roads for heavy traffic. In a number of places, and for many miles, the road has so worn its way down into the loess that deep canyons have been produced. Over the Lingshih Pass in central Shansi, rising to an altitude of 1,200 feet above the



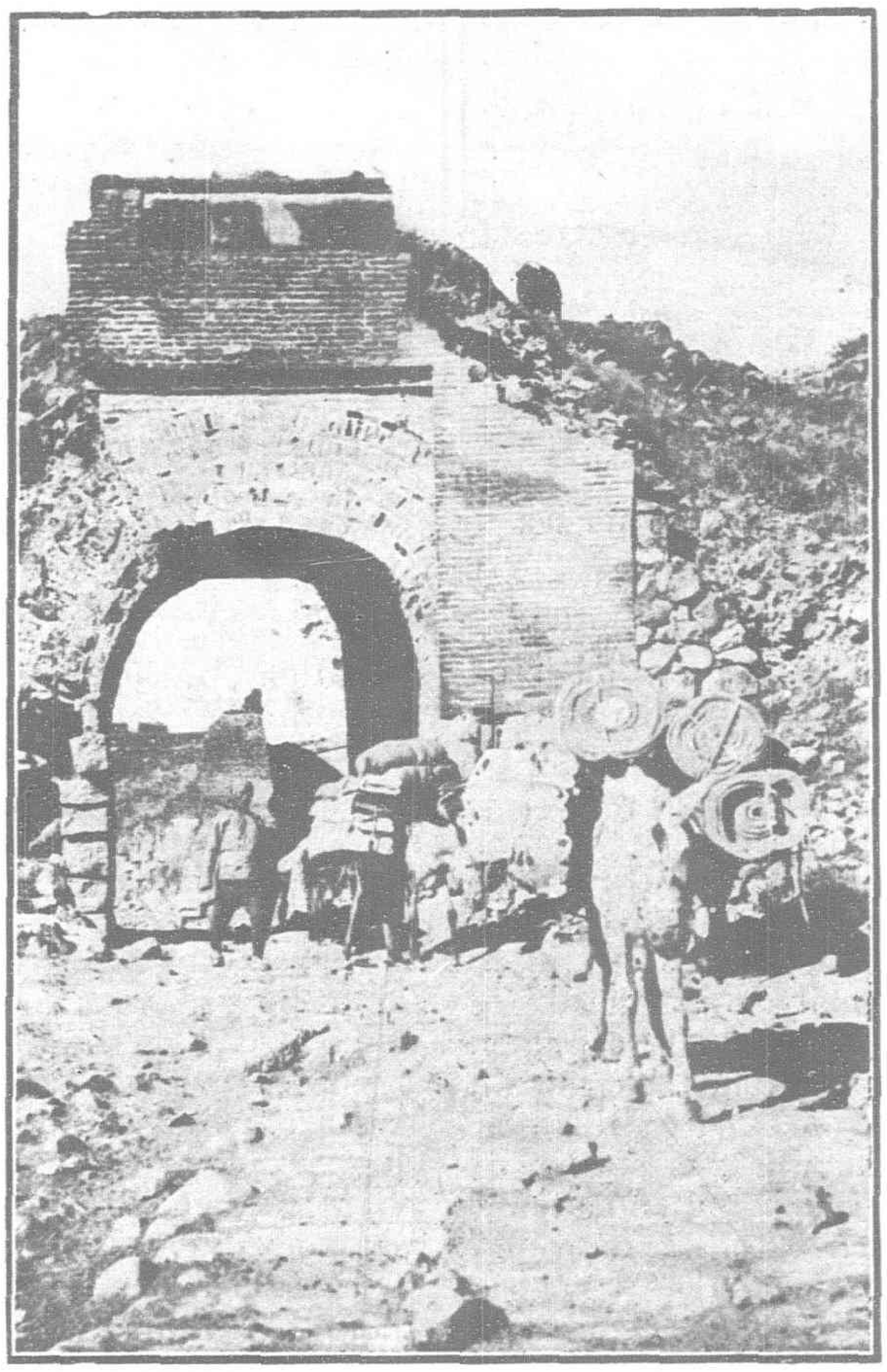
PACK TRAINS MEETING AT A PASSING POINT IN ONE OF THE LOESS ROADS OF SHANSI



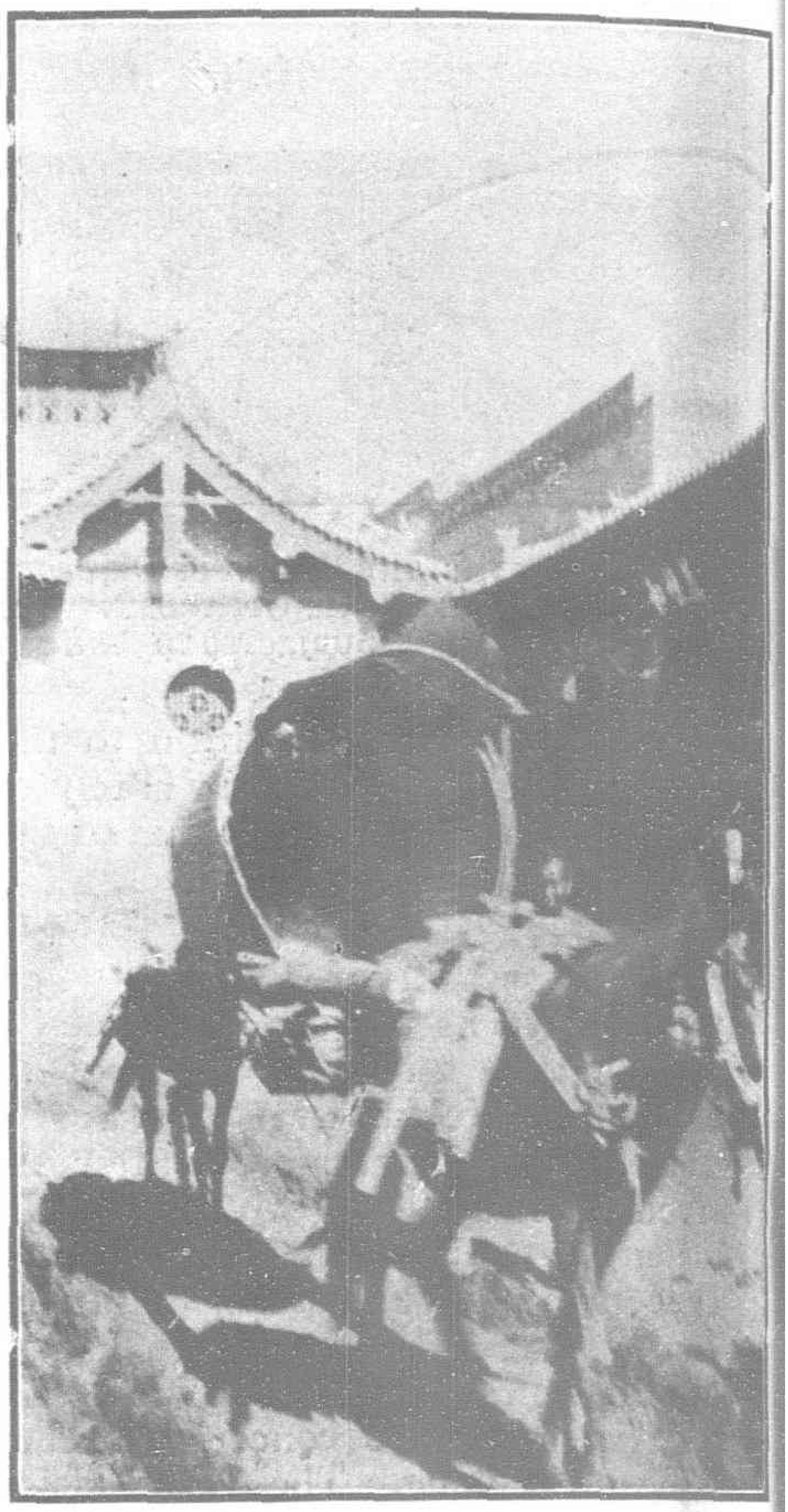
AN OLD GATE ACROSS THE GREAT WESTERN ROAD. NOTE HOW THE GATE HAS BEEN SILTED UP BY SOIL WASHED FROM THE HILLS



Road Through Loess Cliffs



Pack Animals on the Nankao Pass Which Leads from the Peking Plain to Urga



A Mule Litter in a Shensi Town

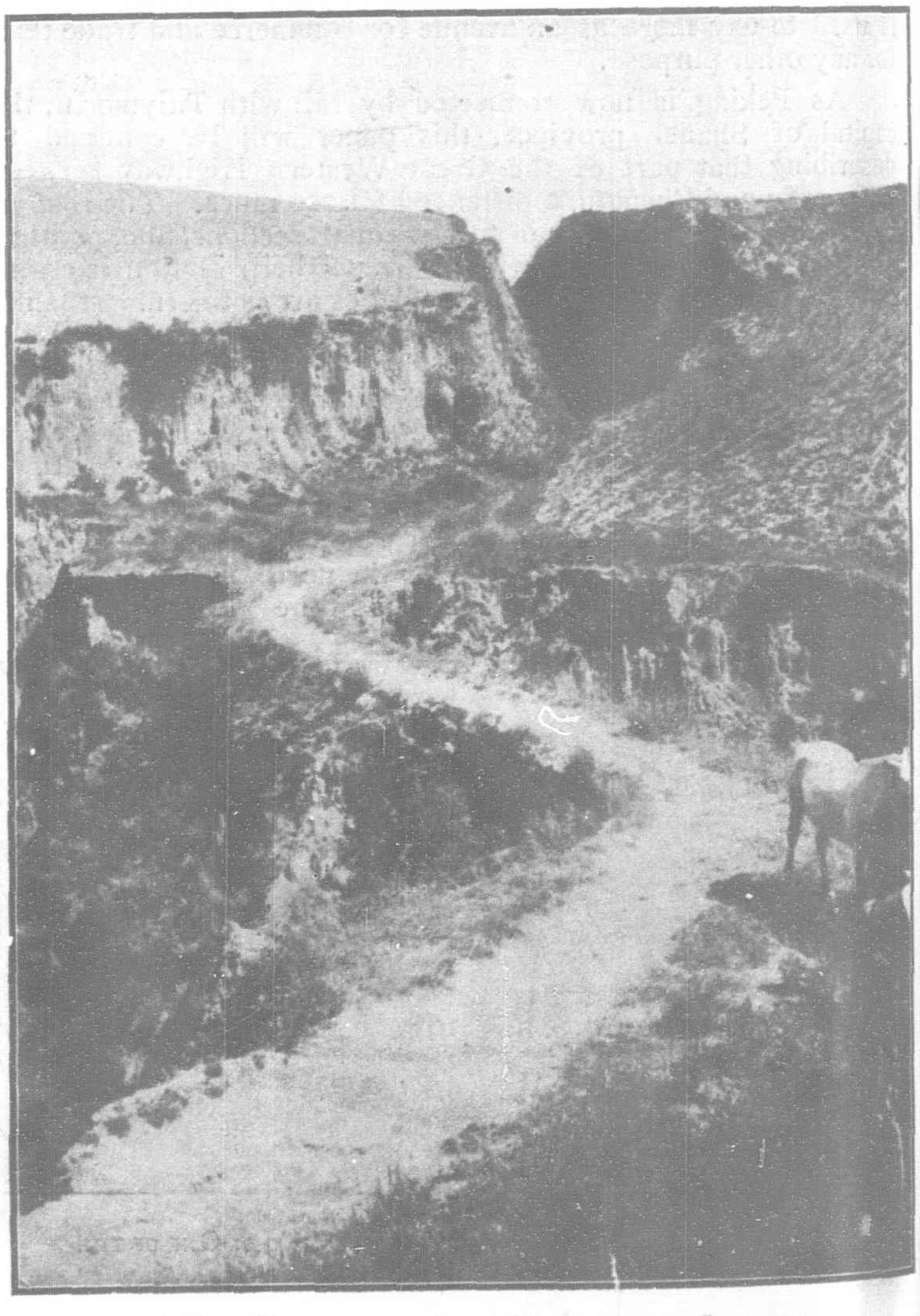
floor of the valley, this highway winds its circuitous way through series after series of these canyons, some of which, with perpendicular walls on both sides, are from one hundred to two hundred feet in depth and not more than eight or ten feet wide.

On the plains, the width of the road varies from forty to one hundred feet. In many places it is lined with trees. From Tungkwan to Sianfu the metropolis of this section of China, the Great Western Highway is, for the most part, an avenue from eighty to a hundred feet in width and lined on both sides with willow, poplar, and mulberry trees. But even where the road is widest, a few days' rain renders it so bad as to be almost impassable, forcing traffic to seek a temporary path, wherever possible, over the fields along its sides. Fortunately for the roads, this entire section receives but a scanty rainfall. Therefore, generally speaking, the road is usually in good condition,—wonderfully good when we consider that it seldom receives any attention or repairs.

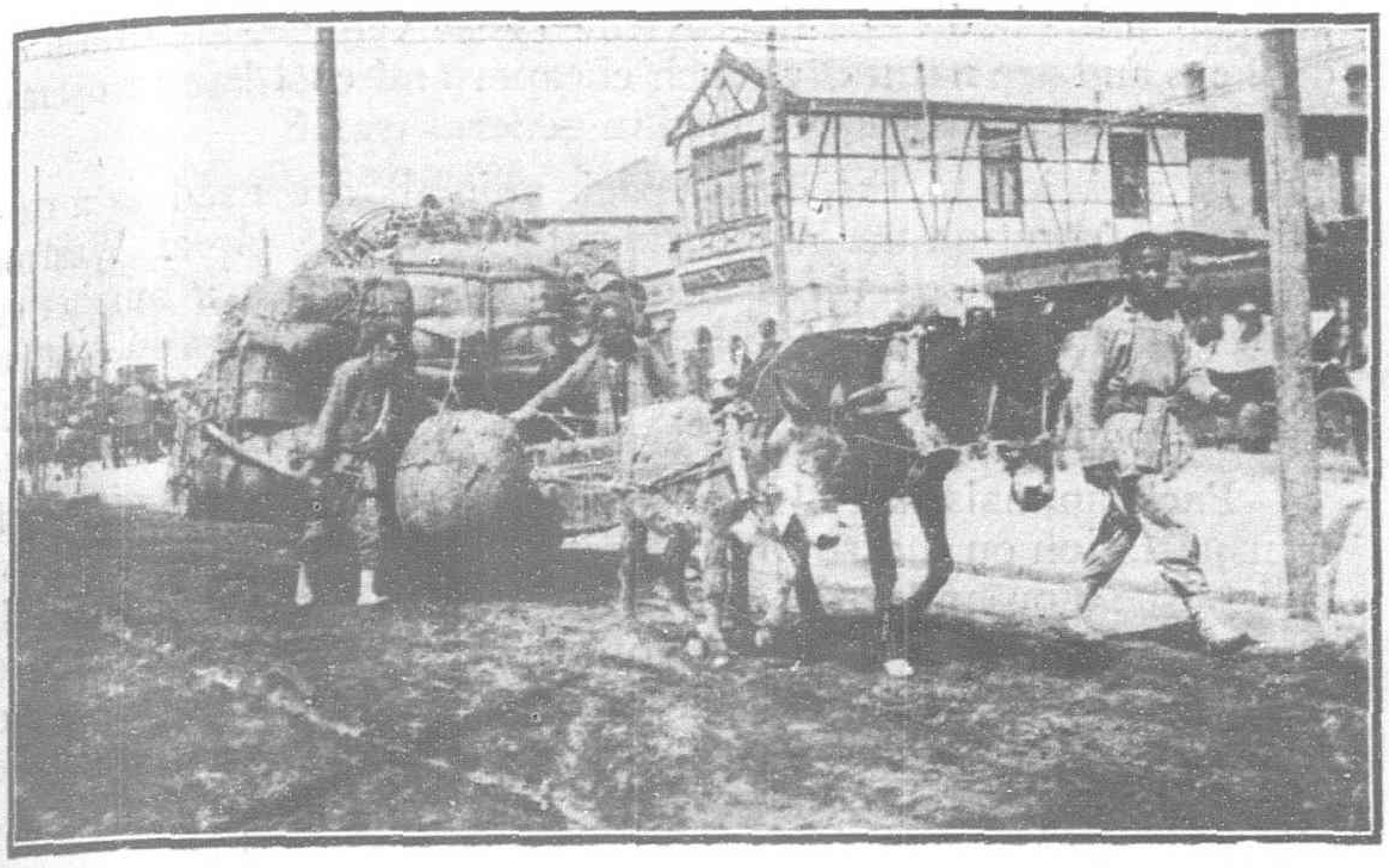
A most interesting and picturesque feature of this section of the Great Western Highway is the large number of stone tablets, encased in brick, which may be seen on each side of the road. Engraved on these tablets are inscriptions commemorating natives who had achieved official position or who had performed deeds commending them to the favor of their fellow men. Sometimes these tablets are erected by the pupils in memory of their illustrious teacher; sometimes by children in commemoration of their parents, in all, making along this route an outdoor " Hall of Fame.''

Through a Sea of Mountains

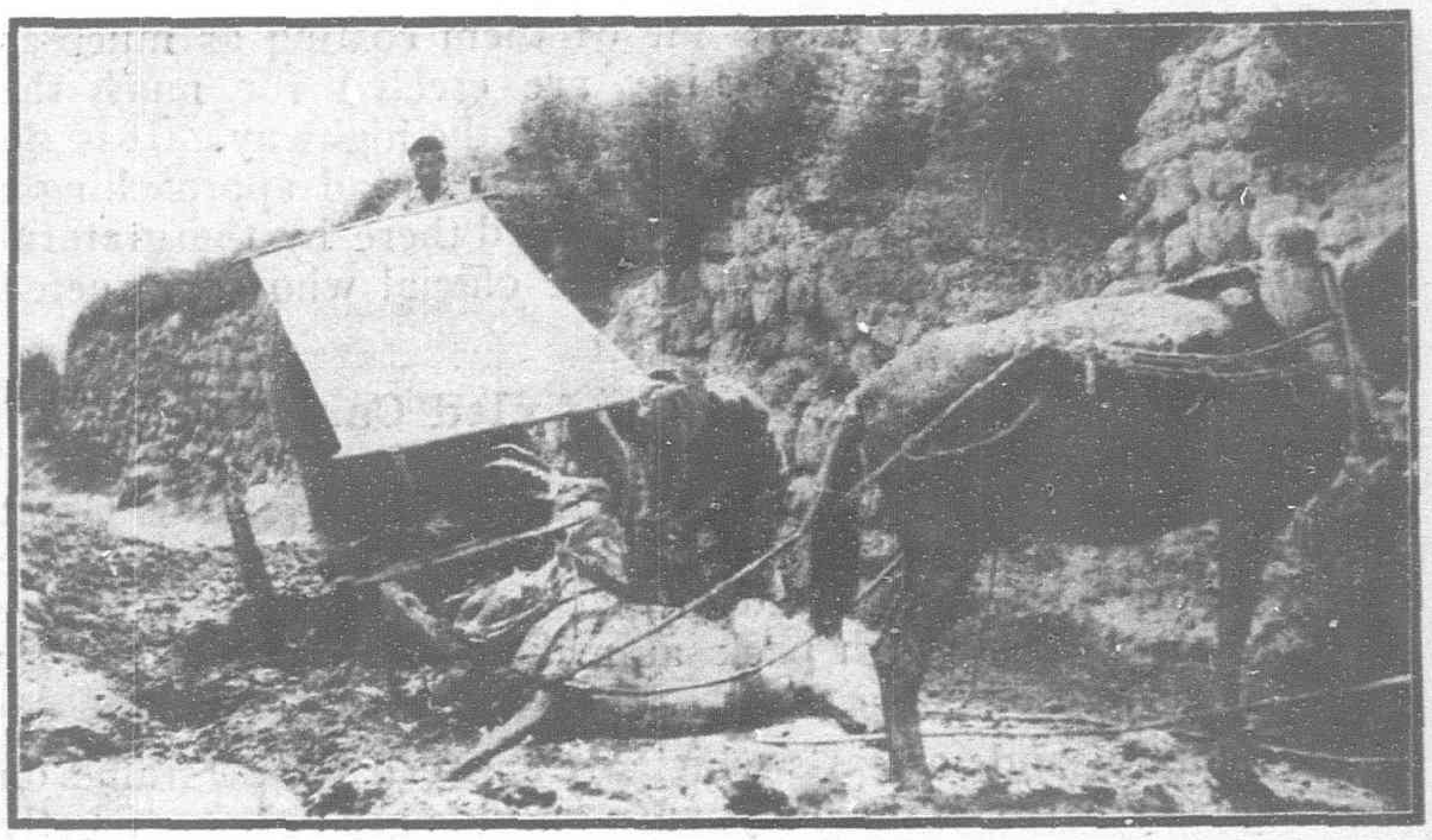
The southern section of the Great Highway after leaving the Wei Basin passes over the Tsingling mountains. It requires eight days to cross this range to the Hanchungfu plain. The road is about seven feet wide and is well constructed—in many places being paved with flagstones. However, during the rainy season, it becomes very muddy in places, and this difficulty, with the added inconveniences experienced in crossing swollen streams, makes travel very slow. The road crosses over eight



A Pass Through the Loess Formation in Shansi



A Huge Wheelbarrow, Guided by Two Men and Drawn by a Pony and a Donkey. Enormous Loads Are Ingeniously Roped on These Vehicles, the Wheels of Which Are Sometimes 5 Feet in Diameter



Even the Sure-Footed, Mountain-Bred Pack Animals Are Not Proof Against the Obstacles of Chinese Roads

or nine mountain passes, the highest being about 7,200 feet above sea level. It is extremely picturesque, for over most of its course it threads its way along the banks of the mountain streams. In going along the banks of the Heilung, it at times ascends a thousand feet above the water, as the banks are, in some places, too precipitous for a road to be constructed nearer the level of the river. Some of the mountains are well timbered. Along the ravines and valleys walnut trees are found in considerable numbers. At the summit of each of the higher passes arched gateways are constructed, on the walls of which are stone tablets with engraved inscriptions commemorating the deeds of certain officials who were instrumental in constructing or repairing certain sections of the road. According to one of these inscriptions the present road was opened to traffic during the year 1829.

From the Han valley across the mountains to Szechwan, the road finds its way over many divides through a veritable sea of rugged mountain summits. For considerable of the distance it is a stone road, and in some places it is very picturesque, being lined with cedars hundreds of years old. At one time the entire road was lined with these trees, but lack of proper attention undoubtedly subjected them to the axe of the wood-hunting natives who are responsible for most of the destruction of the timber in western China. Each of the cedars now standing along this highway is placarded with an official notice warning people against mutilating the tree.

Szechwan Road Is Easier

When one is well into Szechwan, the road improves, the flagstones become more regular, the steep mountain sides are made more easy of descent by means of stone steps, and the number of cedars along the roadside increases. The bridges across gullies are more substantial, more artistic, and in better state of repair than those of Shansi or Shensi; in fact, some of them are objects of genuine artistic beauty.

After the Chengtu Great Plain is reached the distance to the capital is forty-five miles. Until within the walls of Chengtu city the road is dirt, so that in rainy weather the carrying coolie is badly handicapped by the condition of the highway. He is forced to stay in the road because of the paddy fields on either side.

Mule Litters

In Szechwan the monuments along the roadside are fewer than in Shansi or Shensi provinces, but they are far more elaborate, and in some cases are highly ornamental. Approaching the gate of a Szechwan city are always seen a number of "pailos," or triple arches of stone. Before the entrance to some of the cities of the Great Plain there are as many as twelve

An Official Sedan Chair

A Road Through a Rocky Defile Impassable for Vehicles or fifteen of these arches. Some of them costing as much as $500 are distinctly artistic. They are erected for much the same reason as are the monuments along the highway. It is no uncommon thing to see them erected on the road approaching a beautiful stone bridge, having been placed there by the grateful country folk in commemoration of the official who constructed the bridge.

Springless, Wooden-Axled Carts

There is an enormous amount of traffic over this Great Western Highway. Over the northern section nearly all of the transportation is in carts and on pack animals, while over the southern section, though pack animals are used, the greater share is carried by coolies.

The thousands of carts which are engaged in the traffic on the highway between the Taiyuanfu and Fengsiangfu are mostly the large, heavy, two-wheeled Peking carts. These carts, costing from $50 to $100, have no springs of any kind and are built almost entirely of wood—the axles, wheels, and shafts of locust wood, and the rest of softer material. The locust grows very profusely throughout Shansi and Shensi, making Taiyuanfu and Sianfu great centers for the construction of cart wheels and frames. The cart axles, which measure about eight feet in length, extend about eight inches beyond the hubs, while the ends are fitted with iron caps. The wheels are about four and a half feet in diameter and are capped with a narrow iron rim made in segments. Thus a cart never loses its entire rim at one time. Upon these iron segments are set iron cleats to prevent the wheels from slipping.

It would be hardly possible to construct a cart better designed to ruin a road than are these vehicles. They have a carrying capacity of about thirty piculs each (2,700 pounds). The animals drawing the cart are generally hitched in the following order,—a horse in the shafts, three mules abreast in front of the horse, and two donkeys abreast in front of the mules. It must be admitted that there is much ingenuity displayed in harnessing these animals in such a manner, for the horse, the most intelligent of the three, is where he can steady the load, the mules are in the position in which they can pull most effectively, while the donkeys are free to swing the load to either side of the road at the command of the driver. As the roads are deeply rutted, and as the teams must pull over these ruts many times a day, the donkey leaders are distinctly useful. The mule of Shensi is as fine an animal as can be found in America and commands a very fair price, costing from $40 to $200. The horse, although of a good breed, is much cheaper, and can be obtained for from $20 to $60, while oxen can be bought for from $15 to $50, and the small donkey from $10 to $30.

Fight for Right of Way

If these roads were kept in a good state of repair, and if proper vehicles were used, three of these vehicles should be able to haul a ton of cargo twenty-five miles a day. Along this highway, however, it requires twice this amount of mule power. The greatest difficulties of teaming on this road are probably those met with in going over the Lingshih Pass in central Shansi. In many places one can travel for nearly a mile through the circuitous loess canyons and find no place where the road is sufficiently wide to permit the passing of two carts. The Chinese teamster, true to the gambling instincts of his race, seldom or never gets off his cart to run ahead to ascertain whether or not a curve in one of these canyons can be made before meeting another cart. Instead, he drives blindly on trusting to chance that he will get through without delay. Undoubtedly a number get through without having to turn back, but day after day, as many as twenty carts are held up at a time while the opposing drivers fight it out in a war of words to determine which side shall back to a sidetrack.

In southern Shensi a small two-wheeled vehicle is used for carting goods short distances. The axles on these smaller carts are only four feet long, and the wheels, about two feet in diameter, are made of solid wood capped with iron tires, in sections. The axles are of wood, and revolve, being set between pegs upon the bodies of the carts. These vehicles are drawn by donkeys and are naturally much cheaper and cost less to operate than the large, heavy carts used in general traffic.

In addition to the carts, pack animals are used to a considerable extent on the northern section of the Great Western Highway. Most of these are donkeys, although a number of camels are still in use. These animals are generally seen in caravans. They have the advantage of being able to carry native products from districts accessible only by narrow paths.

Pack animals are also used as a supplementary means of transportation on the southern section of the highway, but the bulk of the thousands of tons of produce carried over this rugged, mountainous road is borne on the backs of coolies. The majority of these coolies carry their loads of from one to two hundred pounds strapped to their backs, but a few of them use the carrying pole.

The Patient Human Pack Animal

One cannot but admire the patience and good nature of the Chinese laboring man as exemplified in the conduct of these carrying coolies. They know no Sundays or holidays. Day after day, week after week, and month after month they toil along under their heavy loads, apparently without murmur. These human beasts of burden—there are thousands of them—are out on the road at daylight. After an hour's traveling they stop at a wayside eating stall and for one half a cent purchase a large bowl of cooked flour strings and a steamed roll. At nine another stop is made, probably this time for a bowl of pea broth costing a few cash—about one fourth of a cent. At eleven or eleven thirty the noonday stop is made, and another half cent spent for cereal products supplemented with a dish of beans. At about two o'clock in the afternoon the march is resumed, and, after two stops at wayside inns, is concluded at about six or seven in the evening and sometimes later.

When he reaches the village where he is going to put up for the night, the coolie seldom goes directly to an inn, but may be seen walking back and forth along the village street with his load on his back, dickering with the innkeepers for lodgings for the night. I have seen men with loads of 180 pounds or more strapped on their backs spend fifteen minutes in bargaining with the innkeepers for a difference of two cash (one mille) in the price of a night's lodging. They are usually able to secure lodging for one cent a night. Their food costs them about three cents a day. They receive three or four cash per picul per li or about seven cents a ton mile for their labor. The average coolie carries 150 pounds fifteen miles a day, which means that he makes seven or eight cents a day. Out of this his living expenses net four cents a day. His clothing must mean an expenditure of from one third to one half a cent a day. These, with other minor expenses, must mean that he does well to save an average of about two cents a day, or sixty cents a month, especially when one considers that rainy days and impassable roads, which are not infrequent in the rainy season, reduce his earning capacity. Yet in spite of this meager reward these poor souls toil day after day with no visible signs of discontent. No matter how large his burden or how rough the road, the coolie seems always to have a pleasant reply for the passer-by who would question him as to the distance to the next station, or ask any particulars concerning his load, or his earning capacity.

We passed thousands of these coolies upon the road, saw hundreds of them eating at the stalls, and scores of them at the village inns, but never once upon our whole journey did we see them disorderly or quarrelsome. The fact that the carrying coolie drinks no wine and is forced to choose a vegetable diet probably assists greatly in keeping him orderly. His only indulgence seems to be his little slender Chinese pipe, in which he smokes a cheap inferior grade of native tobacco. It would be difficult to find anywhere a set of men who exhibit better physical development than these carrying coolies.

On the mountain roads one occasionally would meet a coolie with a box suspended from each end of his carrying pole and discover two little eyes peeping through little holes in the side. Sometimes there would be two children in each box. This seems to be the ordinary method of transporting small children around west China.

Miscellaneous Means of Transport

Among other means of transportation along this great highway we found in the Wei Basin a number of wheelbarrows supplementing the carts in carrying the wheat shocks and other farm products from the fields to the village threshing floors. It must be remembered that in this section of China the farming population lives in walled villages.

For passenger traffic in Shansi and Shensi mule litters, carts, saddle horses and mules, and donkeys, are common. The better class people, including the officials, prefer to ride in closed Peking carts, in mule litters, or on horseback. These mule litters cost but five cents per mile, and include two mules and a litter, an extra mule for baggage, a donkey for the servants to ride, and a coolie to act as muleteer. The wealthier women use the closed carts, but one often sees a bound-footed peasant woman, dressed in silks and with fancy hair ornaments, perched on a donkey, while her son walks by her side. The poorer people who can spare a few cash often ride in open carts, especially the women who cannot walk because the atrocious custom of foot-binding has made cripples of them.

Along the southern section of the road, where no wheeled vehicles are to be seen, sedan chairs, horses, mules, and donkeys are the common means of transportation for human beings. A sedan chair costs but three cents per mile and includes, besides the four chair coolies for the chair itself, two extra coolies for baggage.

By taking a mule litter, one can go from Taiyuanfu to Sianfu, a distance of 408 miles, in sixteen days. On a pony one can make the same trip in twelve days. To go from Siangfu to Chengtu, a distance of 720 miles, if carried in a sedan chair with four chair coolies, would take twenty-four days, making an average of thirty miles a day.

An Enormous Flow of Products

As already stated, the amount of freight carried over this Great Western Highway each year is enormous, especially when we consider the crude and expensive methods of transportation in use. In Shansi the bulk of the traffic seems to go northward. In June we passed hundreds of carts and pack animals bound northward, laden with flour, paper, salt, coal, red kiaoliang, rape, hemp, rape seed oil, and other native products. One caravan of donkeys was laden with lumber, each animal carrying two locust timbers about fifteen feet in length and one foot in diameter. During one day we saw about two hundred tons of cargo moving northwards. Practically all of these goods were destined for Taiyuanfu, part for consumption there, and part for transhipment north for Peking and Tientsin.

In the Wei Basin we passed as many as twenty or thirty carts at a time, laden with hides bound from Kansu to Honanfu, there to connect with the railway for shipment to Hankow. Undoubtedly much other native produce from the Wei Basin and Kansu found its way to the Peking-Hankow Railway in a similar manner. As the Wei Basin harvested its banner wheat crop in June, nearly all of her means of conveyance were then pressed into service, hauling the wheat shocks from the fields to the village threshing floors. Sianfu is the great distributing center for this section of China. It is a city of 200,000 people and one of the most ancient in the entire Chinese Republic. As the Great Highway passes directly through the city there is a constant stream of carts and pack animals, going in and out of the gates, the distance between the east and the west gates being three miles. Along either side of this stone-paved city thoroughfare, for the entire distance of three miles, there is a continuous row of one and two storied shops and inns. These, with the extensive traffic on the streets, give to the city a very businesslike appearance.

In the mountains along the southern section of the Great Western Highway, we passed hundreds of coolies bound northward, carrying loads of dried tobacco stalk, sugar, salt, tea, notions, paper, matting, straw hats, umbrellas made of oiled paper, and medicines, mostly from Szechwan, destined for Kansu and Sianfu. Those going south carried cotton from the Wei Basin, and licorice root and other herbs, and wool from Kansu, destined for Hanchungfu. We also passed donkey caravans going northward, laden with iron bars, silver, paper, sugar, salt, and dried tobacco stalks. At one place we passed a caravan of thirty donkeys each laden with 250 pounds of pig iron traveling thirty miles a day and bound from Hanchungfu to Lanchowfu, a distance of 700 miles.

How Costs of Transport Are Piled Up

The average cost of cart transportation in Shansi is five cents a ton mile. In the Wei Basin it ranges from four and a half cents to eight cents a ton mile, depending upon the volume of business.

The carrying coolies, who monopolize the traffic over the southern section of the Great Western Highway are paid seven cents a ton mile. We passed upon this road as many as three hundred of these coolies in one day—that is, within a distance of thirty miles—each carrying an average at least of 125 pounds a distance of fifteen miles a day. Thus to transport these twenty tons a distance of fifteen miles requires three hundred men working a whole day, and costs $21. One ordinary freight car in America can carry this amount the same distance in one hour at a cost of less than one tenth of this amount. Here in western China a laborer costs six or seven cents a day, yet to transport one ton of wheat over a thousand miles of this Great Western Highway traversing Shansi, Shensi, and Szechwan provinces would cost at the very least $50. Contrast with this the cost for wheat transportation by rail from Chicago to New York for transhipment to Liverpool, which is about one seventeenth of the cost in western China, where labor is thirty times as cheap but where it would require fifty or sixty days to cover the distance done in America in three.

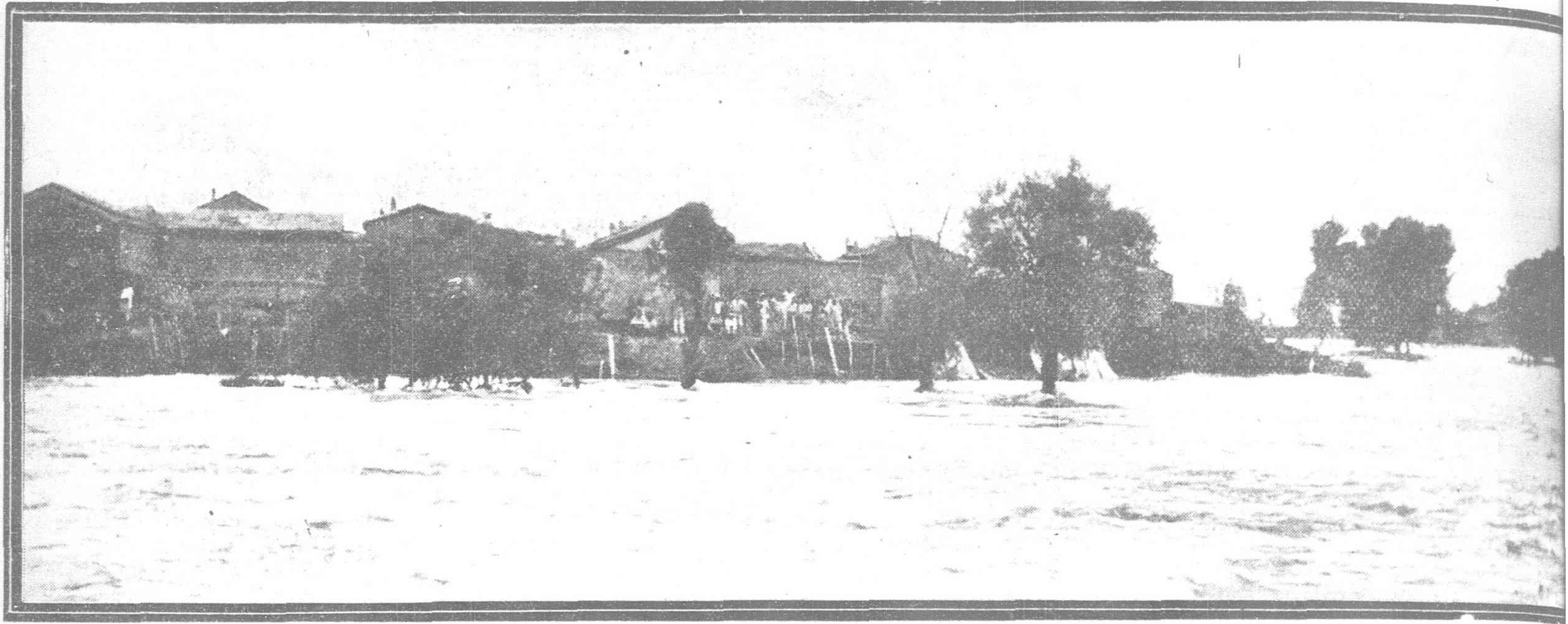
Yet despite what would be considered absolutely prohibitive transportation rates in America, there are, as we have already noted, to be seen daily on this great highway in western China thousands of carts, thousands of pack animals, and thousands of carrying coolies, engaged in transporting these hundreds of tons of cargo. It is difficult to imagine a people in greater need of railways than these along the Great Western Highway. Without proper facilities for marketing their produce, they are unable to establish credits for themselves in other parts of the Republic, thus having nothing to draw upon in times of drought. Hence when a famine strikes these provinces it strikes hard; Shansi lost half of her population in the famine of 1878, and Shensi lost nearly half of hers in the famine of 1901. Shansi and Shensi have produced the largest wheat crops in their history in recent years, amounting to over 50,000,000 bushels; but with prices ranging from twenty-five to thirty cents a bushel, it is difficult to find an outlet for this enormous crop, for it costs half a cent a pound to transport it a distance of but 200 miles. It costs $5 a ton to transport coal a distance of 100 miles—and there is more coal in Shansi and Shensi than in Pennsylvania.

RAILWAY TRAFFIC INTERRUPTED

The heavy rains at the end of July and early in August caused unprecedented floods, which washed away considerable sections of the embankment of the Peking-Hankow Railway. Traffic was stopped and it is estimated that repairs cannot be effected before the end of October.

A report by one of the engineers of the Peking-Hankow Railway recommends that the reconstruction of the Yellow River Bridge be proceeded with during the next three years.

Mr. K. Y. Kwang, the ex-engineer-in-chief of the Peking-Kalgan-Suiyuan Railway, has been appointed chief engineer of the northern section of the Tientsin-Pukow Railway. Mr. Kwang is one of the foremost of China's railway engineers and has gained an excellent reputation for efficiency and integrity.



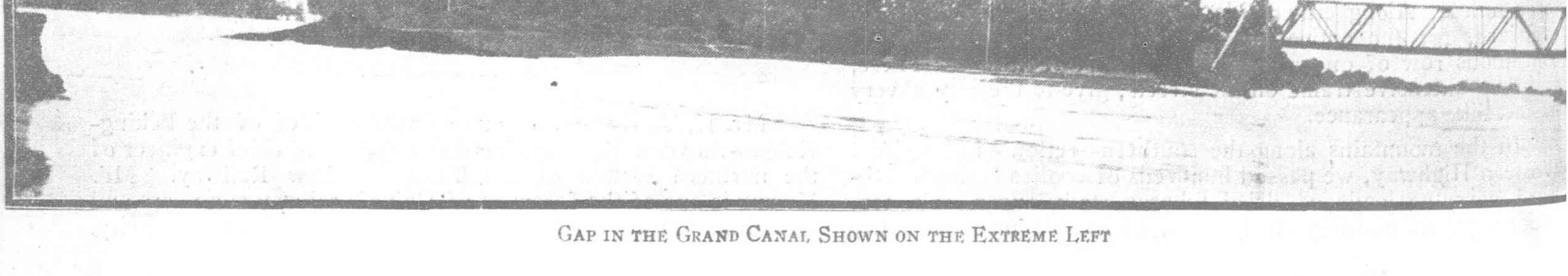
WHERE THE GRAND CANAL BROKE. THE GAP IS BETWEEN THE CAMERA AND THE VILLAGE

The Port of Tientsin Menaced

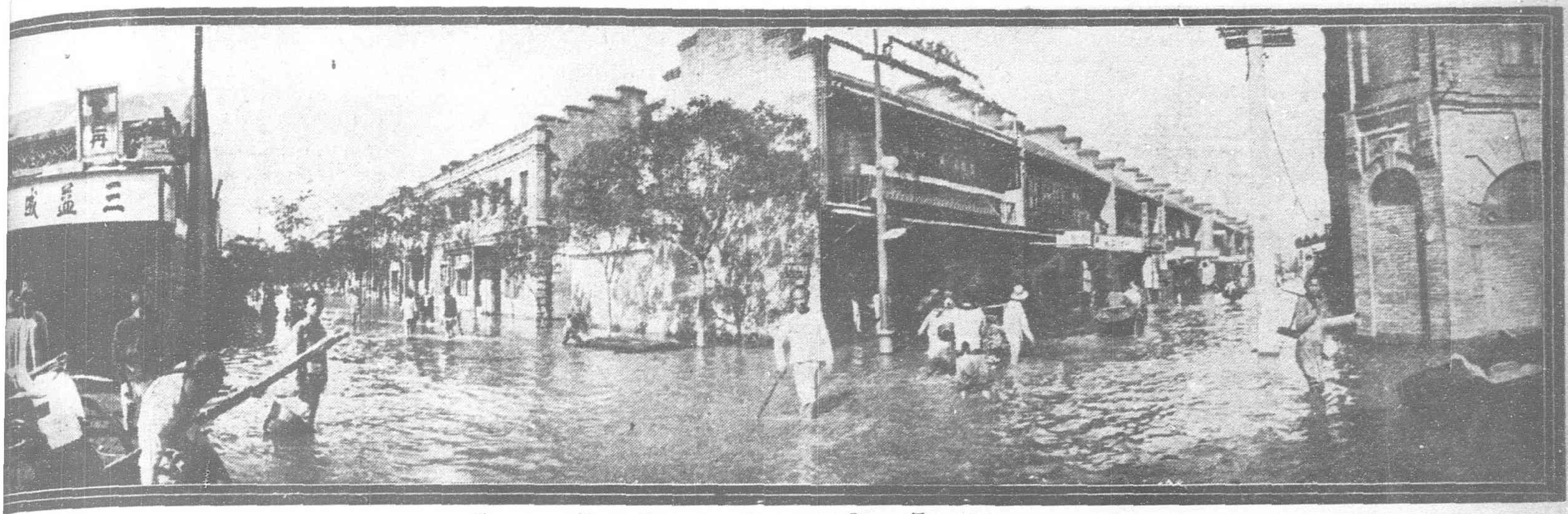
Record Floods Cover 15,000 Square Miles of Chihli Province and Cause Tremendous Loss

Millions of Chinese are homeless, thousands have already perished, hundreds of millions of dollars' worth of damage has been done to Chinese crops and houses, and the native city and foreign settlements of Tientsin—the most important port in China next to Shanghai—were threatened with demolition and have been seriously damaged by the floods in Chihli province. The loss caused by stoppage of trade, interruption of railway traffic on the Peking-Hankow and Tientsin-Pukow railways has not yet been estimated, but it must run into the millions. The cost of repairs to the Peking-Hankow Railway will be a large figure.

On this line alone there were over 600 washouts and business was naturally stopped completely on its northern sections, and was not resumed until the middle of October, and then in parts only over temporary structures. A correspondent who traveled over the line illustrates the devastation wrought, by pointing out that one river, the Sha-ho, came down forty feet deep and two miles wide, cutting a swathe of desolation through numerous villages and thousands of acres of cultivated fields. Two massive stone piers of the railway bridge were taken out by the foundations and carried away. Massive steel girders weighing tons were whirled away like straws and brought up on sand banks six miles below. Five villages in the vicinity were so completely obliterated that their sites cannot be found. And there were 600 breaches in the railway embankment! The damage was widespread, and the loss of life and misery caused was correspondingly great. Yet the floods that wiped out large parts of the Peking-Hankow Railway are in a sense separate from those which are now surrounding Tientsin and covering some 15,000 square miles of the territory in the vicinity, though due to the same causes. As mentioned in an editorial article in this issue, the Tientsin floods—as they might be called for the sake of convenience—are caused by heavy rains flooding a group of rivers rising in the mountains to the west of Peking and Paotingfu, and one from Shansi province. These have spread over tremendous areas and have wiped out villages,

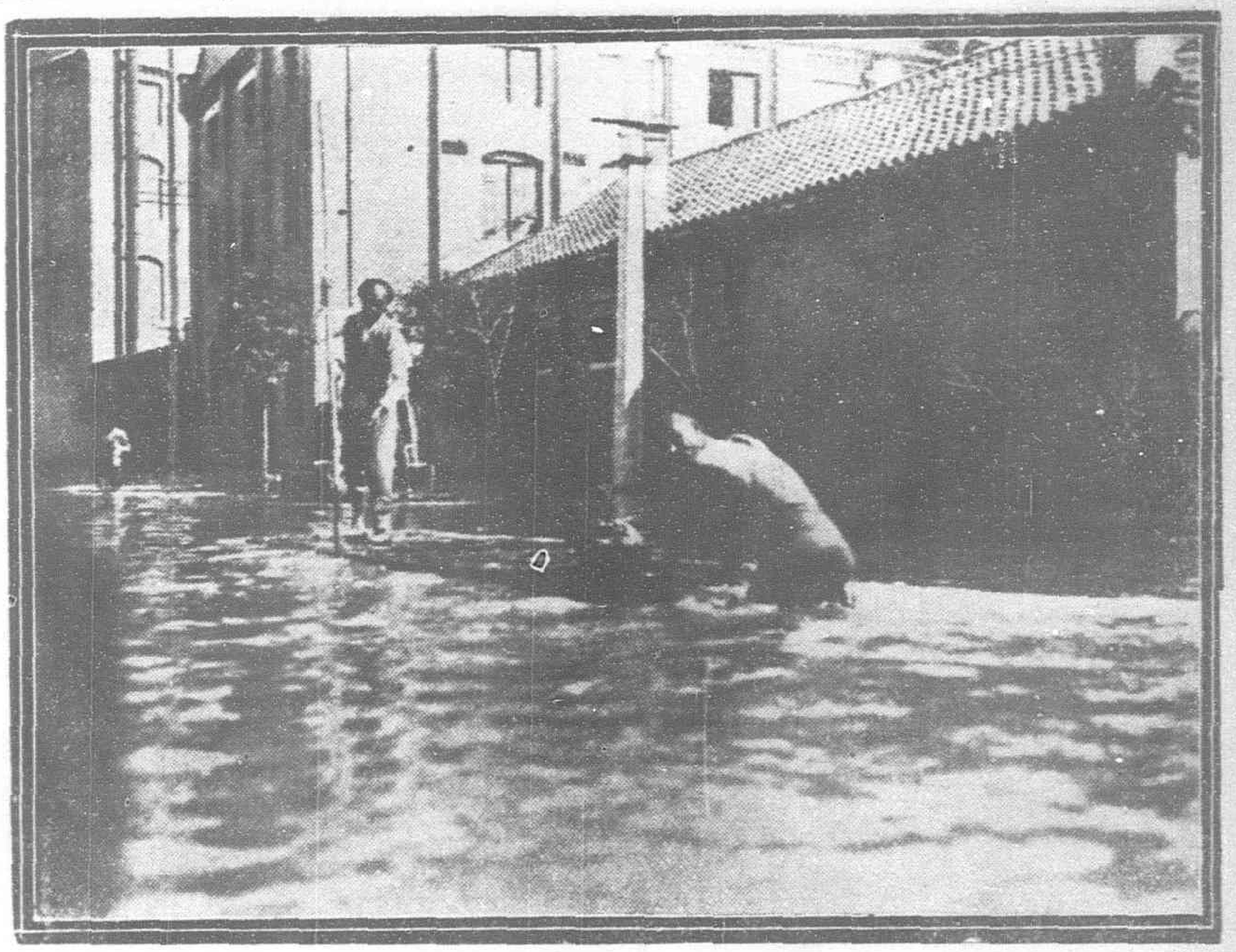


GAP IN THE GRAND CANAL SHOWN ON THE EXTREME LEFT



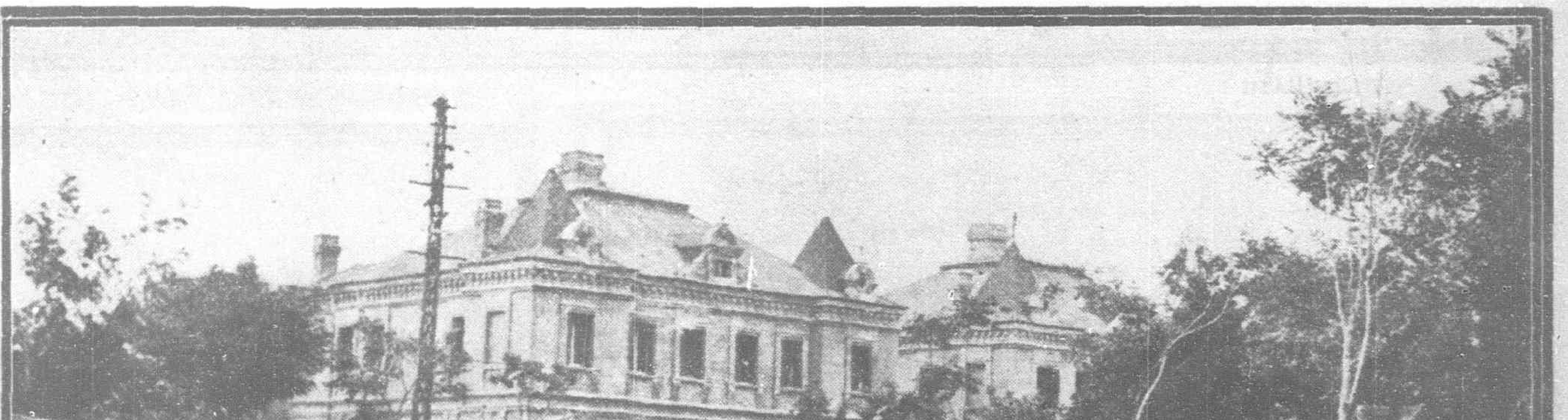
Corner of Taku Road and Dickinson Road, Tientsin

None But the Fair Deserve the Bold



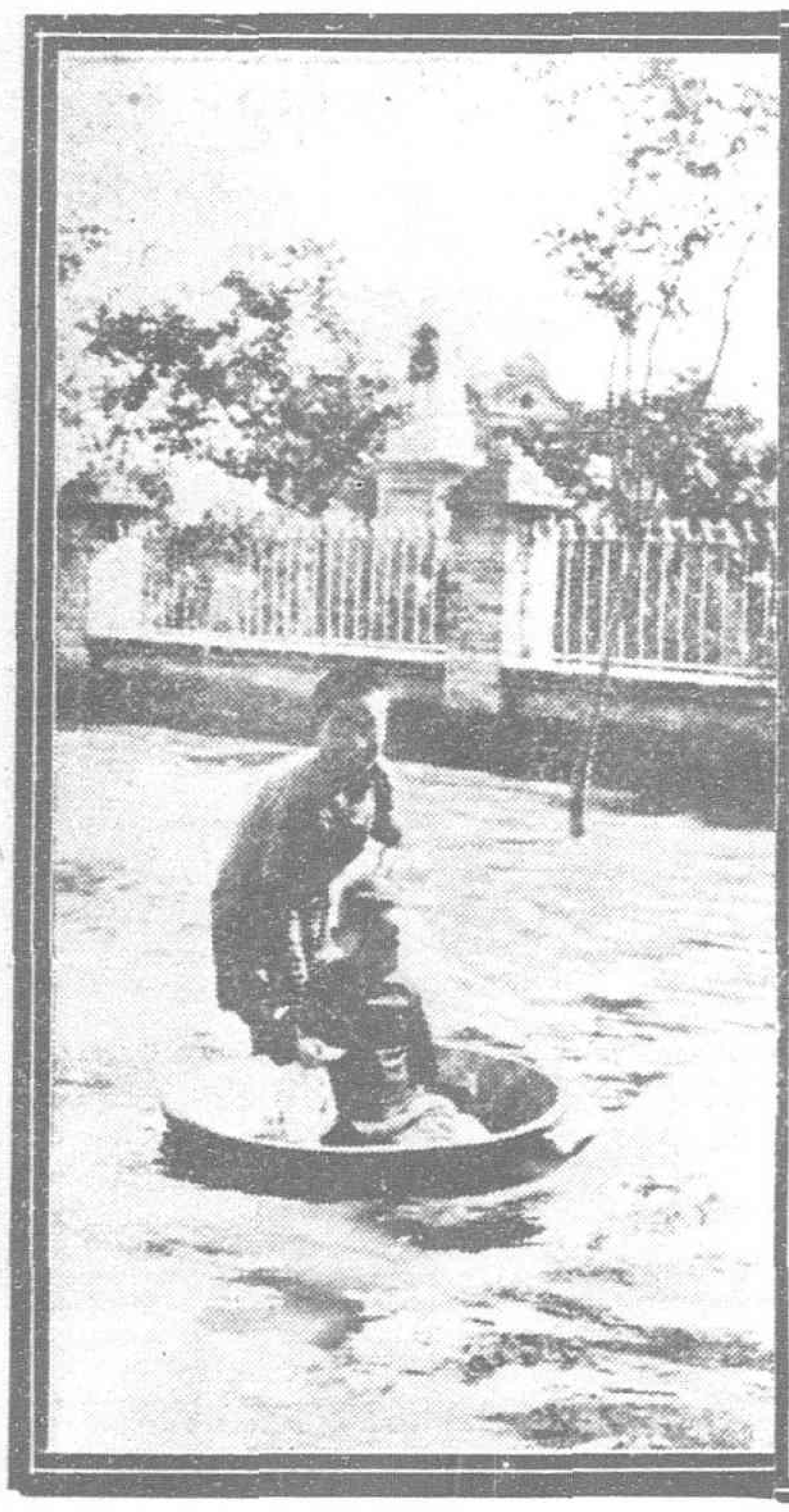
A Front Door Being Utilised for Conveying Provisions

A Fair Sculler

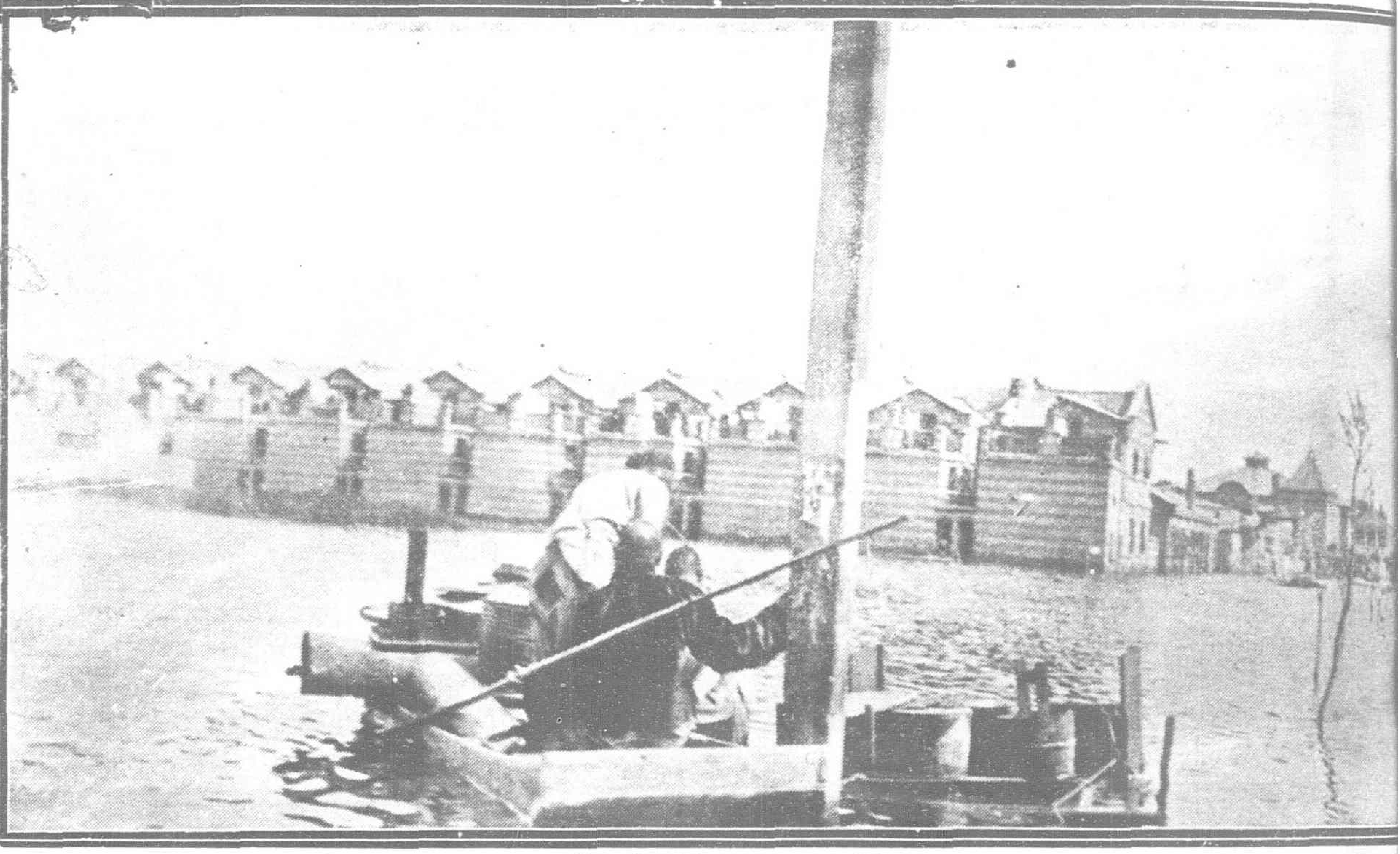


Corner of Davenport and Council Roads

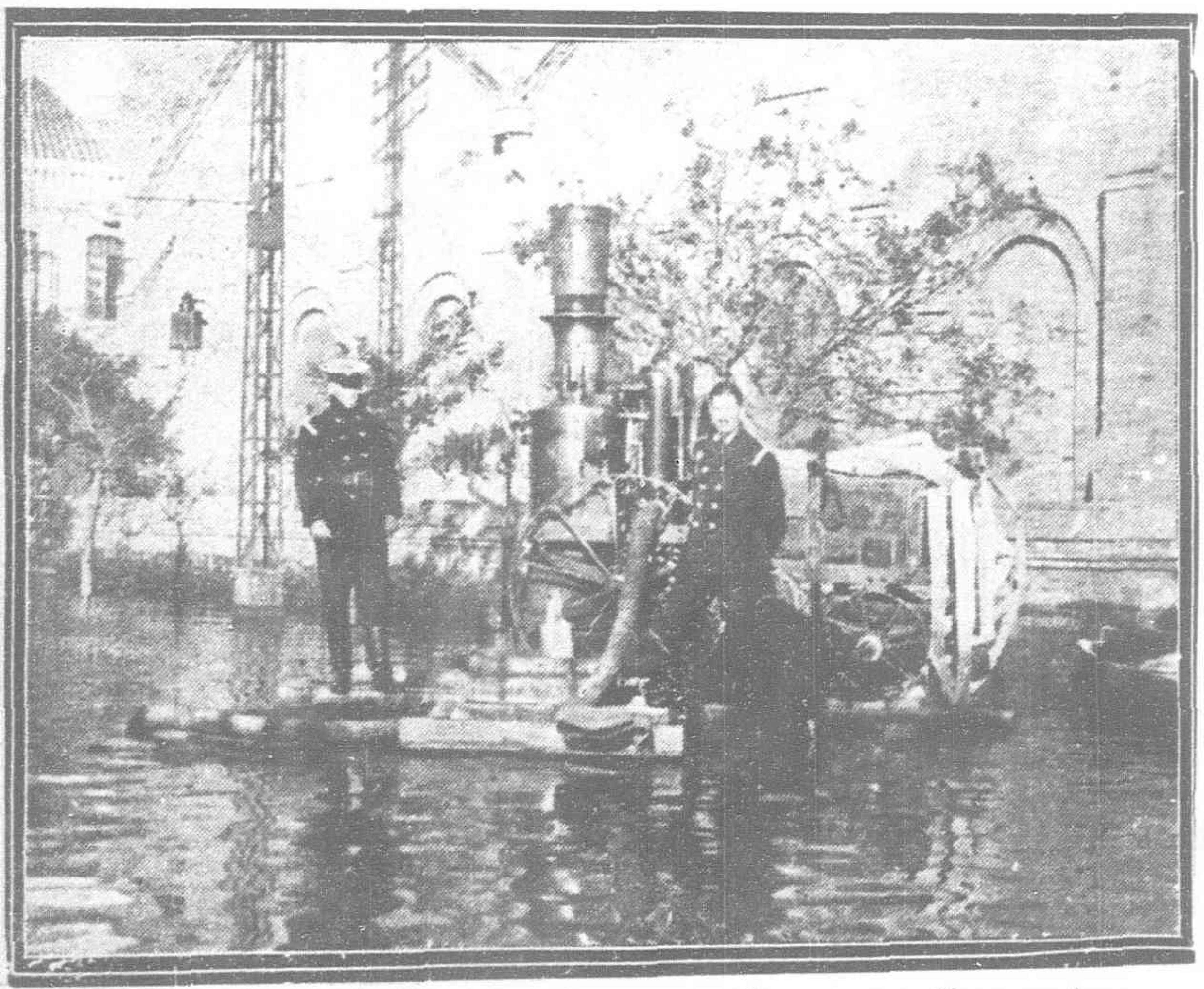
The New American Barracks



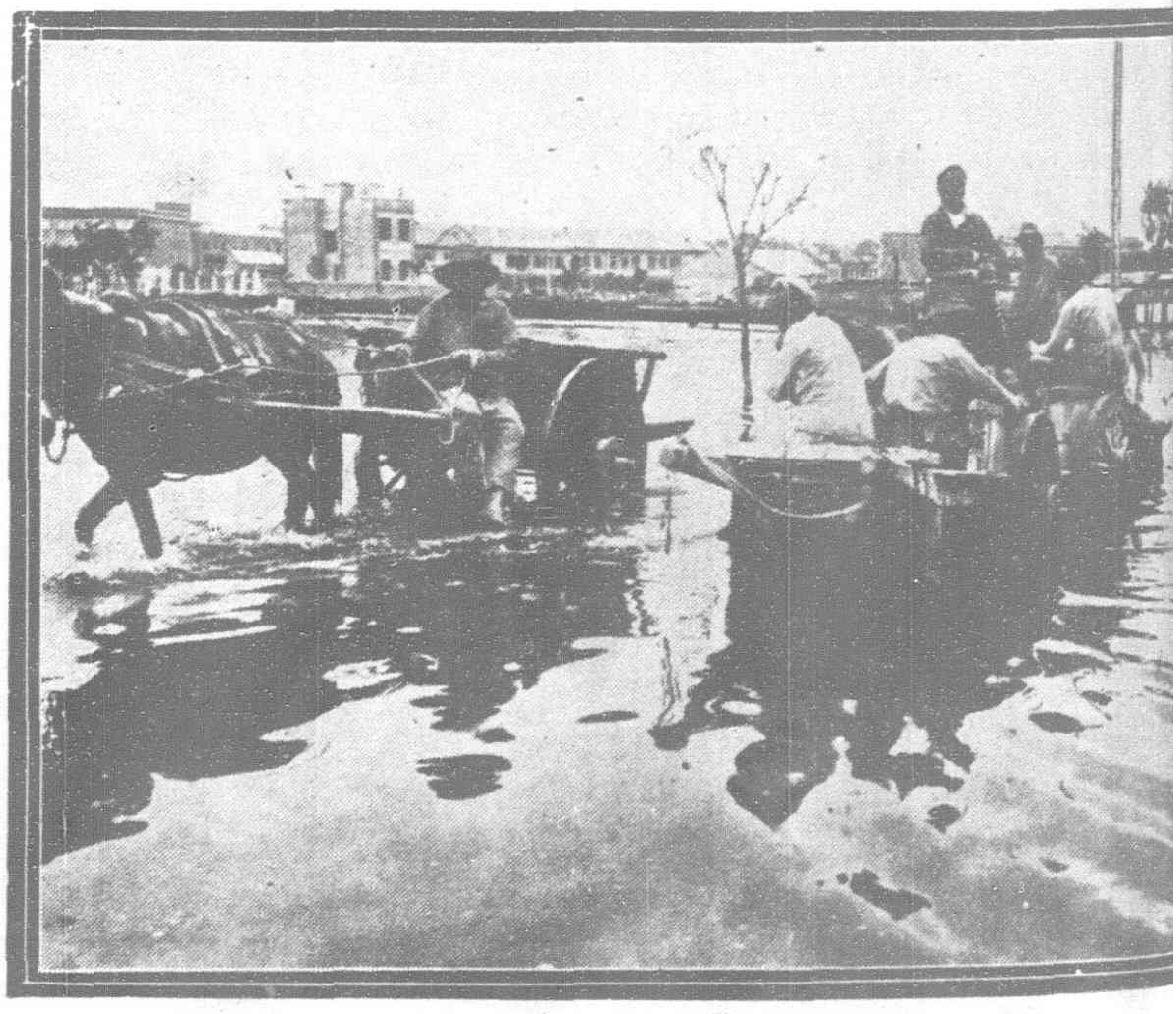
A Dry Bath



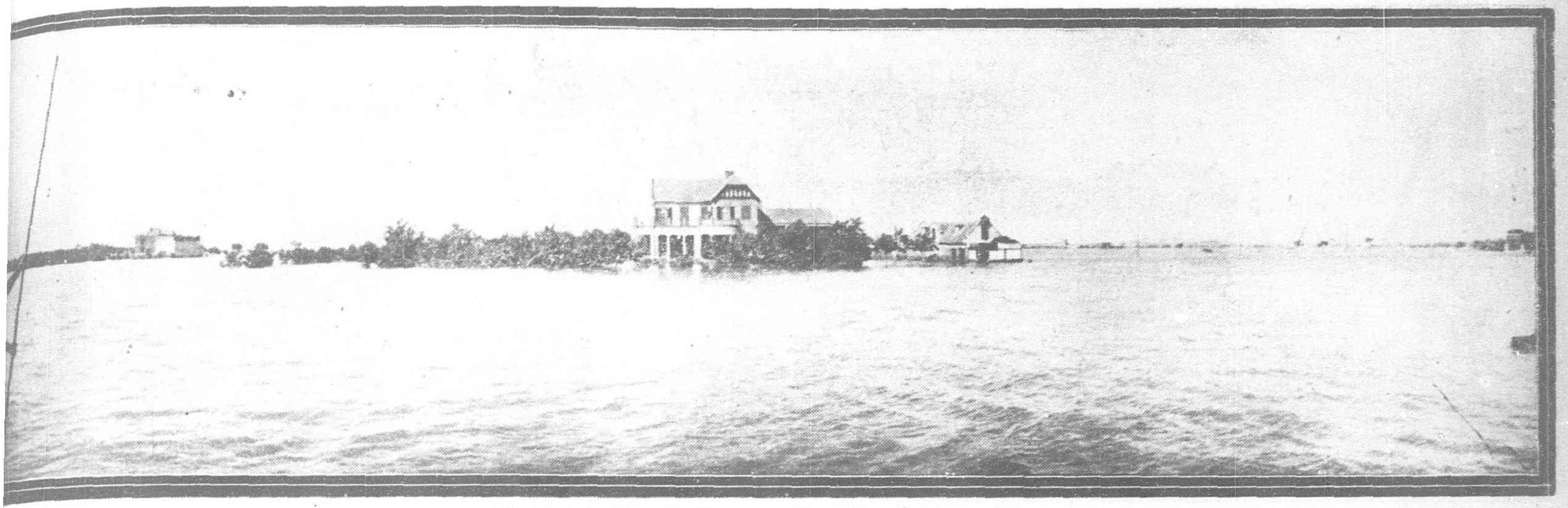
The Red Village under Water



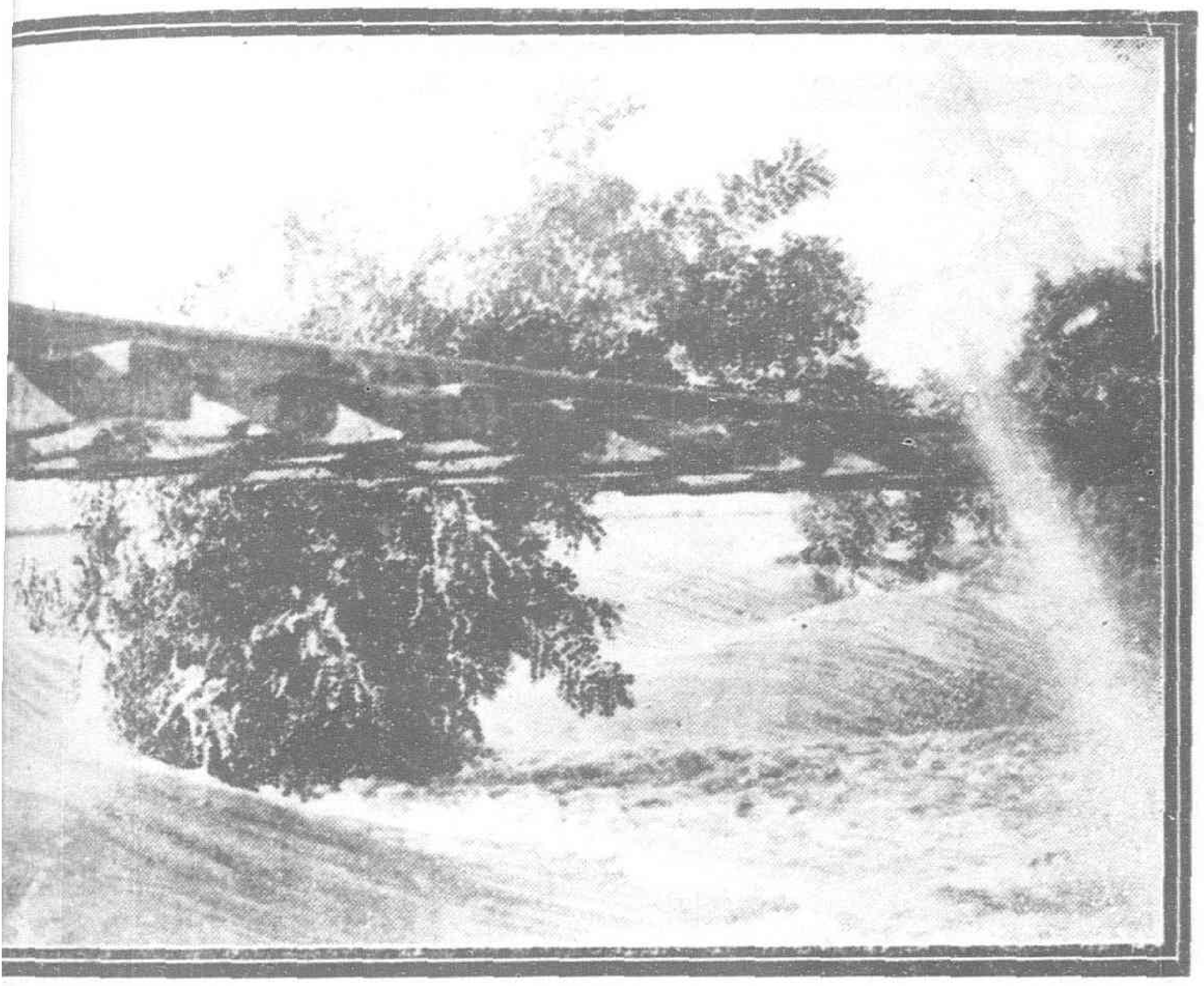
Pumping Engine and Hose Cart Ready for a Call in the Flooded Area



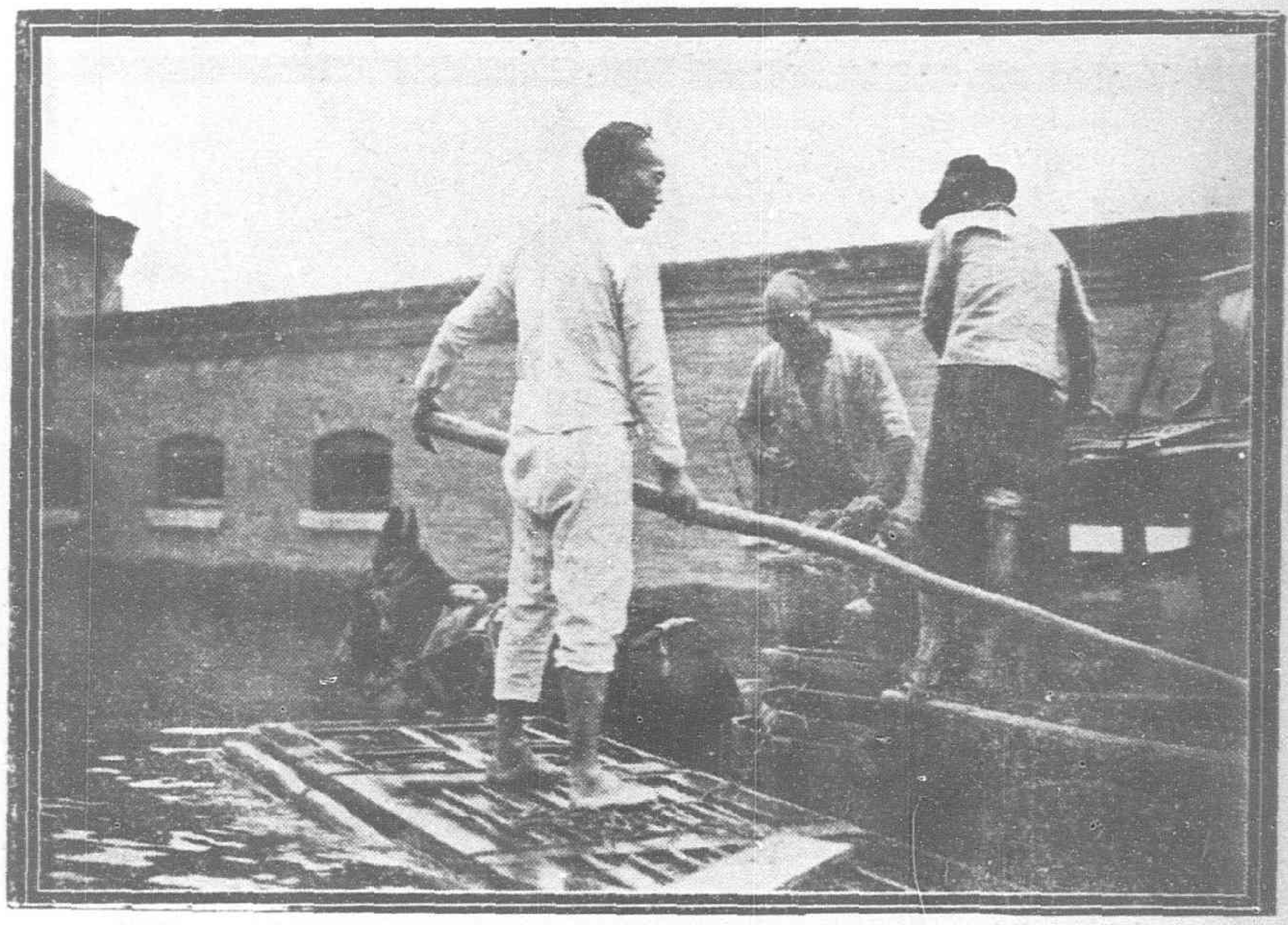
Salvage by Carts



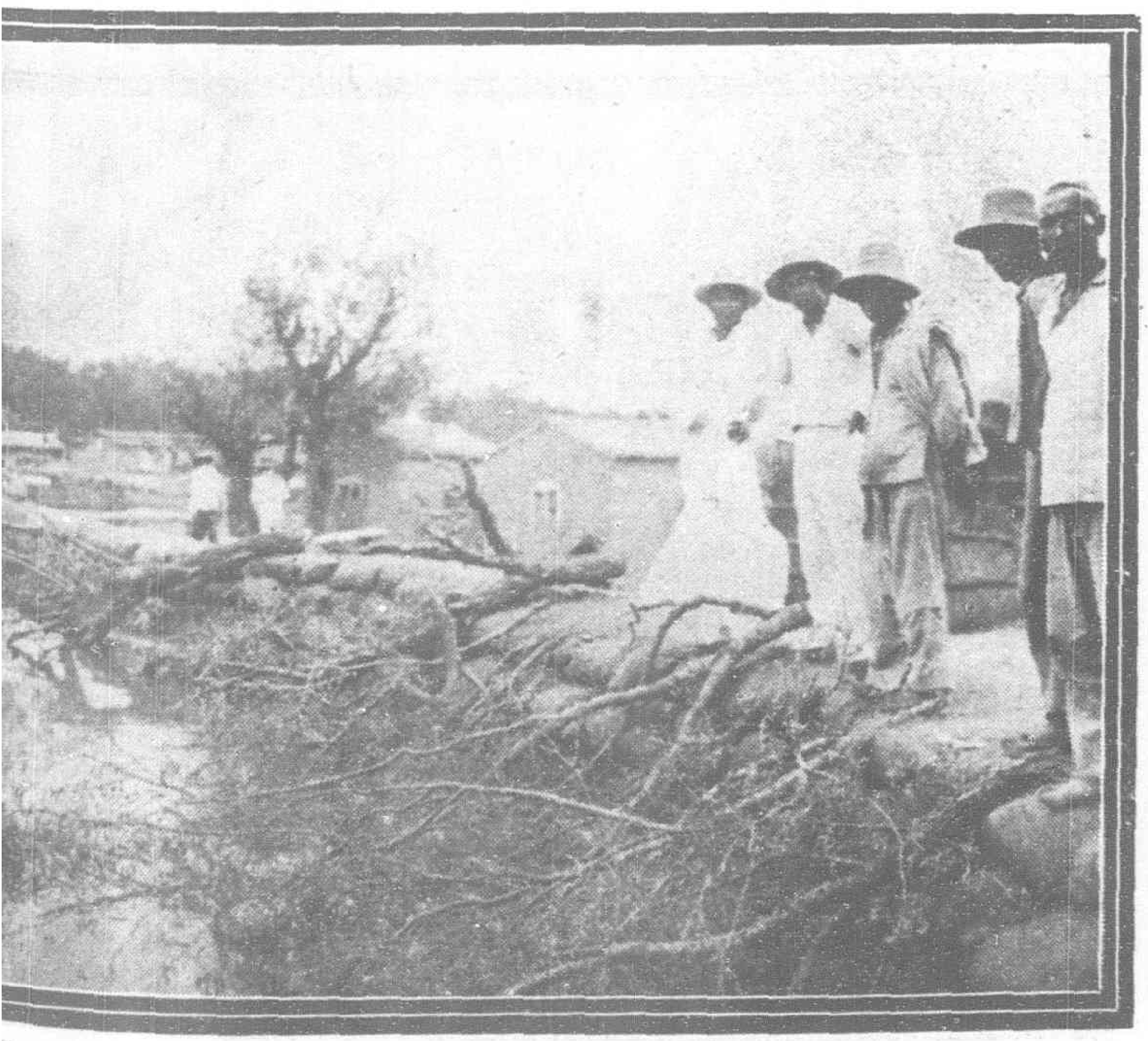
Mr. F. J. L. Shaw's House on Race Course Road



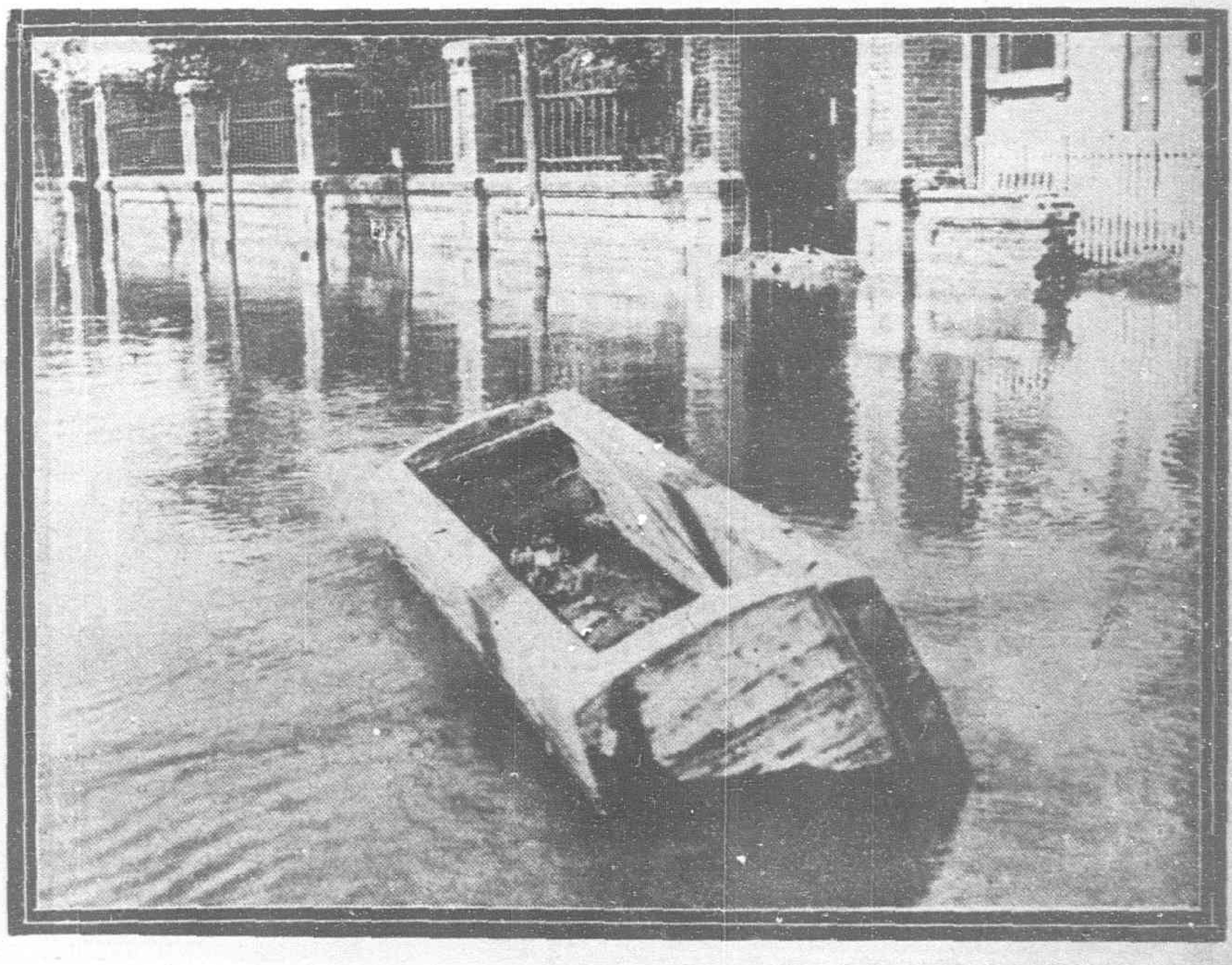
IN Pu Railway Cut by Villagers to Relieve Their Village. This Cut, One Yard Wide, Extended to 50 Feet in Width and 8 Feet Deep in Half an Hour. One of Many Cuttings.



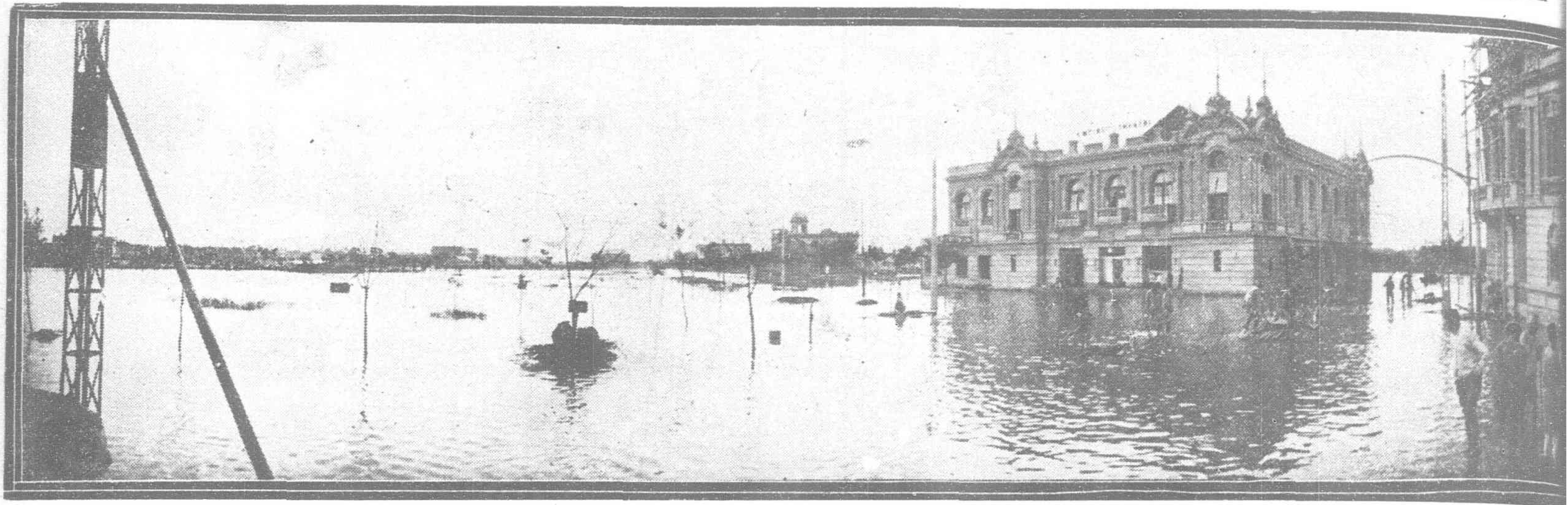
Transferring Furniture from Raft to Mule Cart near British Market



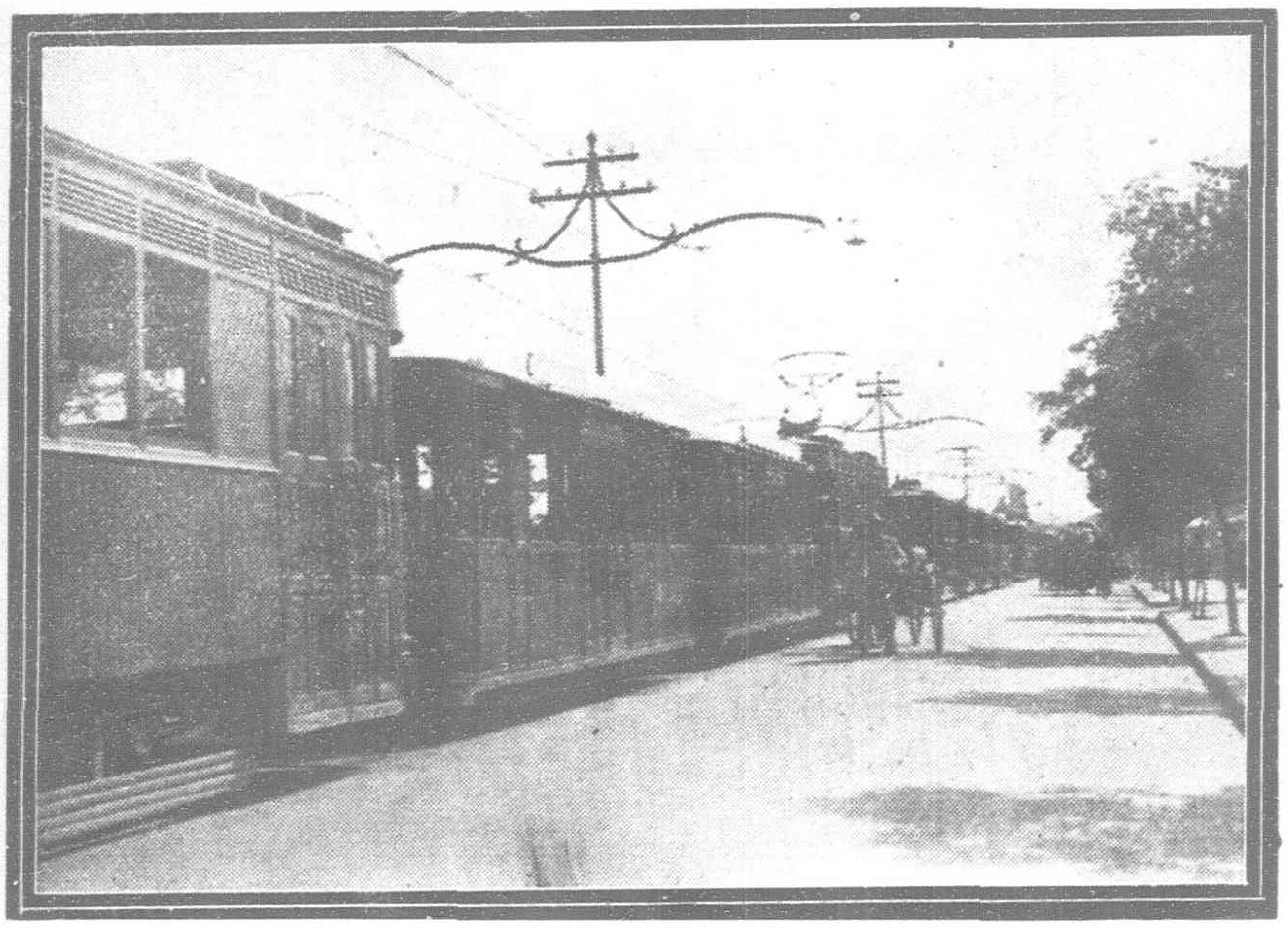
The Bank of the Grand Canal Showing Method Used in Raising It



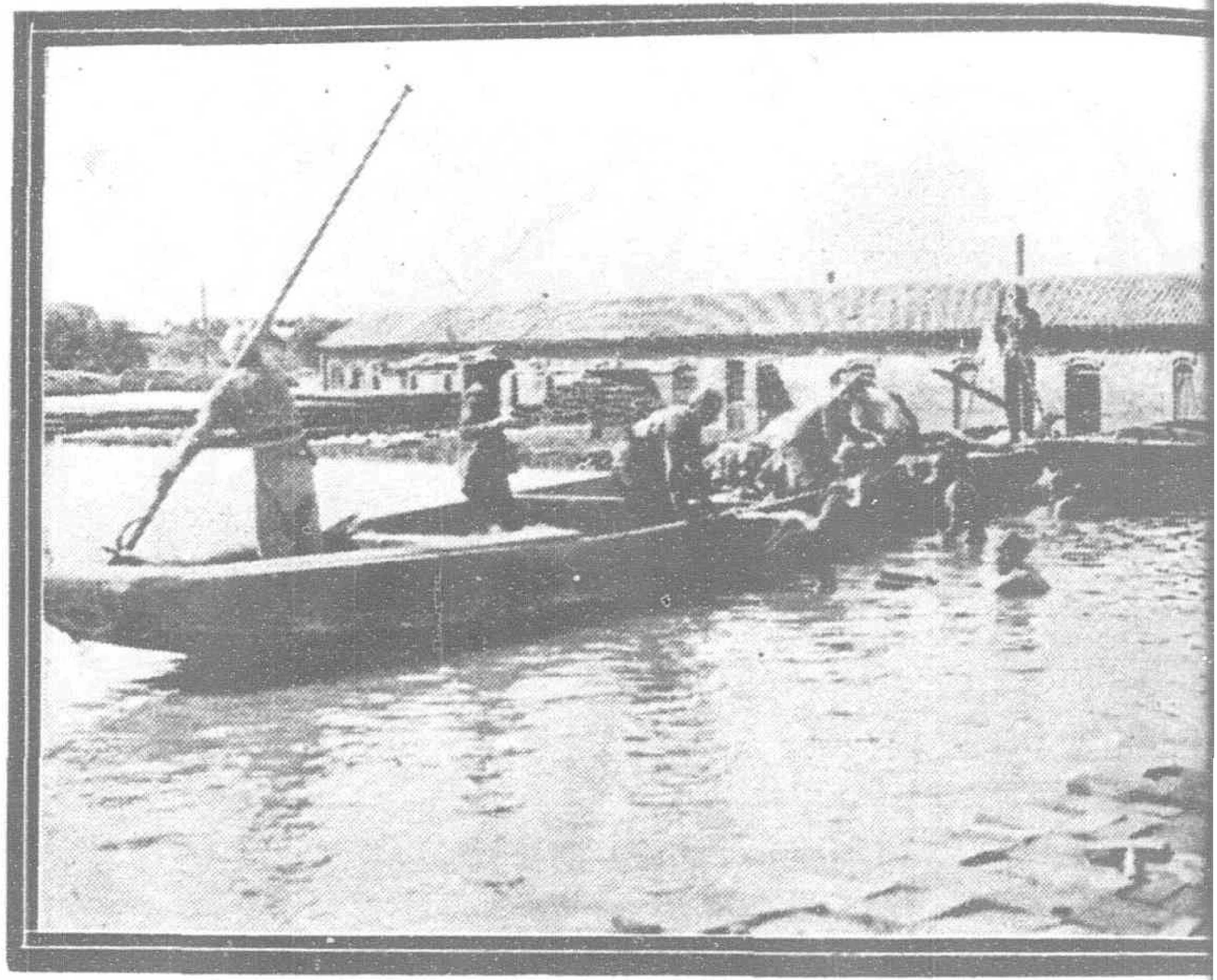
A Gruesome Sight. Chinese Coffin Carried by the Flood into the Concession Area



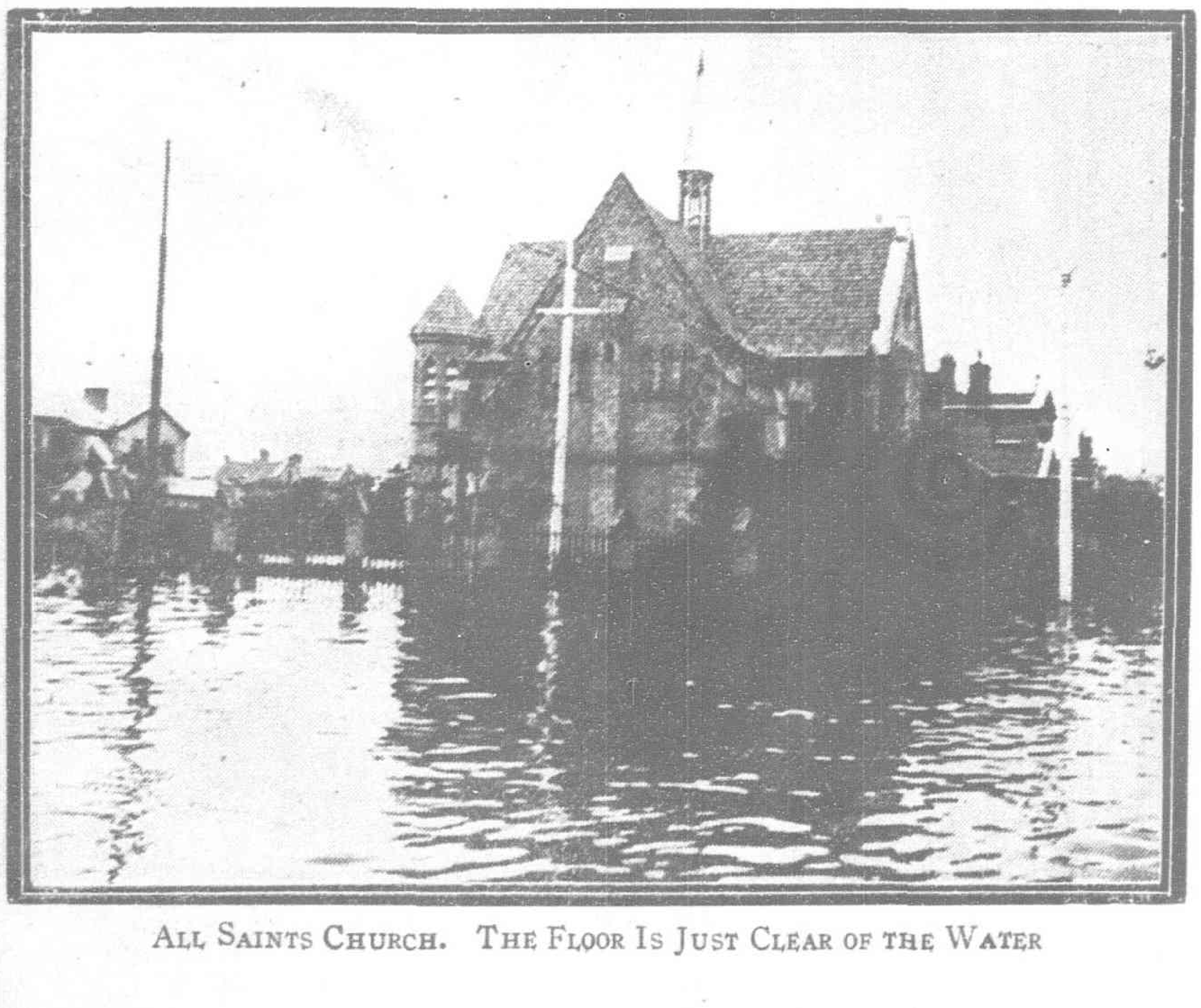
Empire Theatre and French Park



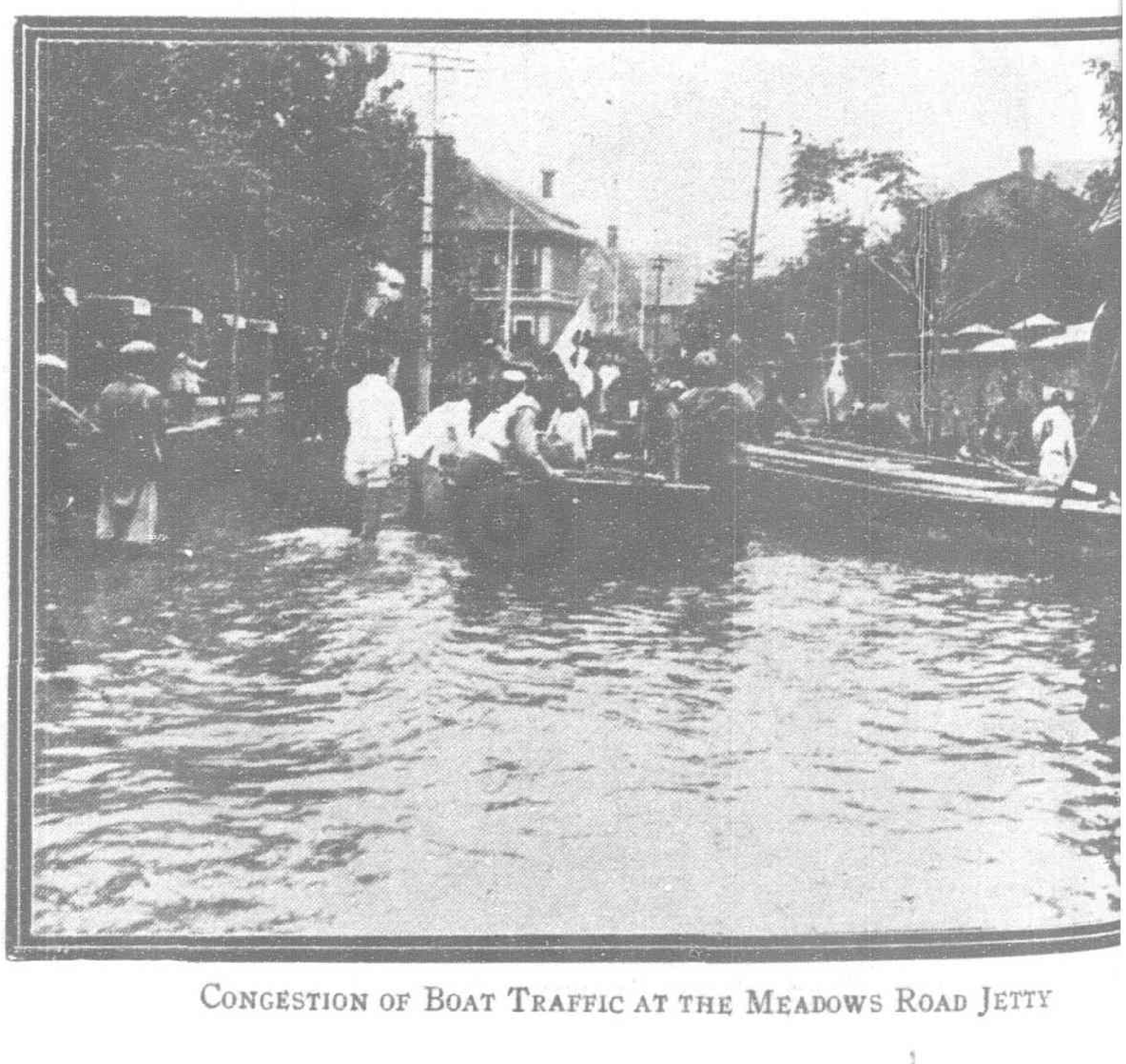
This Is Not a Railway Train But the Isolated Tramcars in the Italian Concession



A Flooded Brick Factory



All Saints Church. The Floor Is Just Clear of the Water



Congestion of Boat Traffic at the Meadows Road Jetty

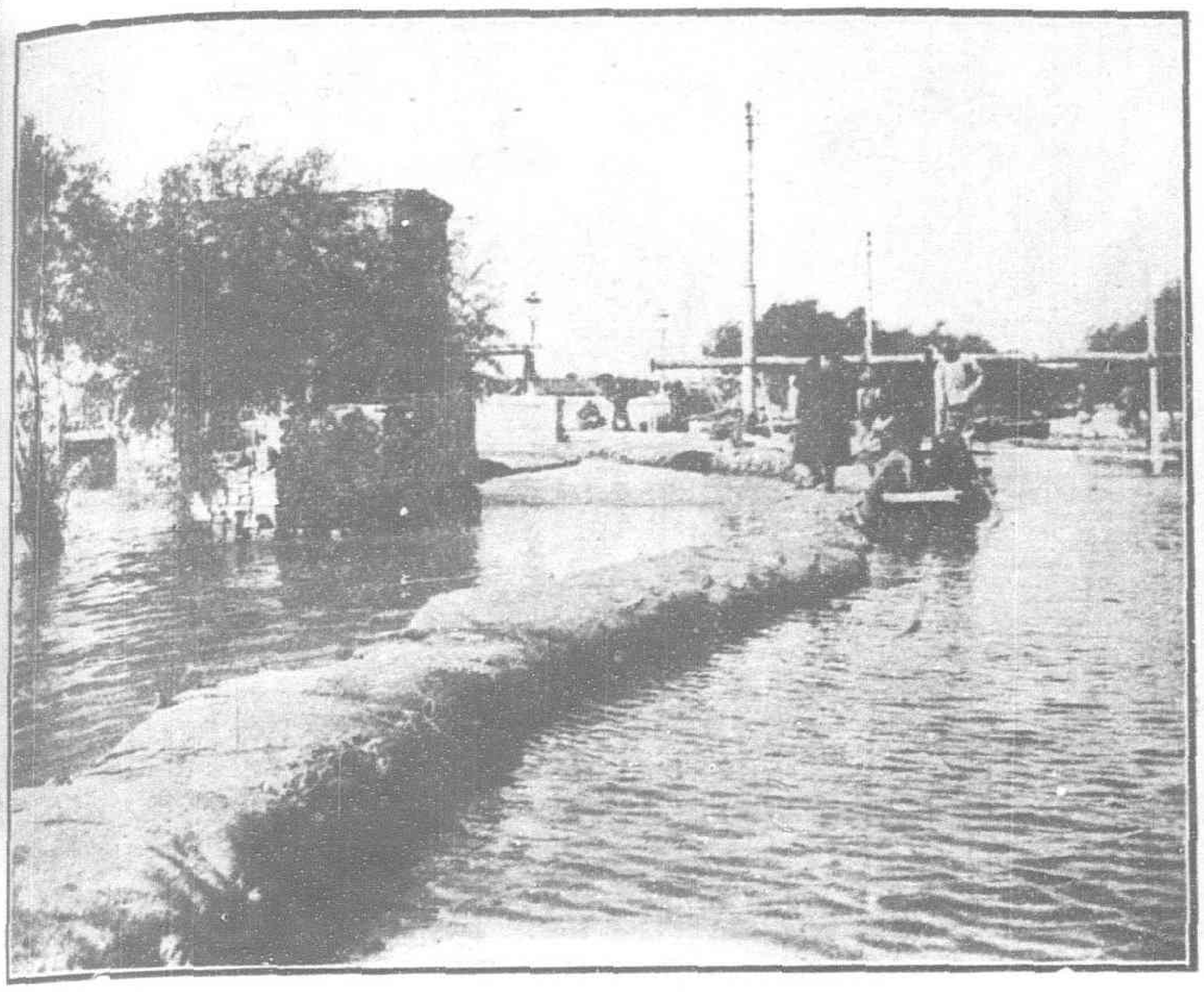


Photo J. E. Hayes

A Dyke in the French Concession

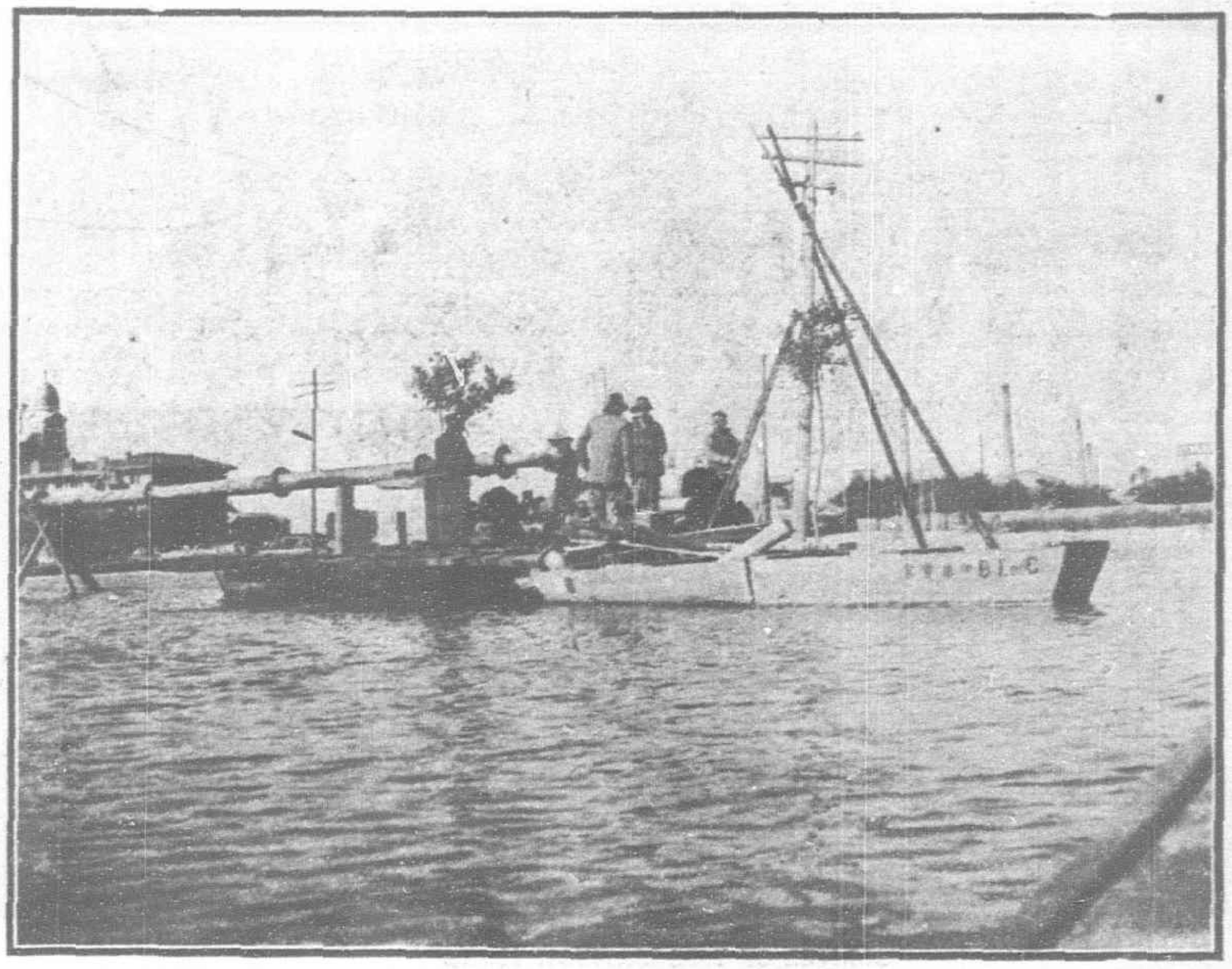


Photo J. E. Hayes

A Pump Ready for Operations

covered cities, and destroyed crops. The loss can be calculated in hundreds of millions of dollars. What the loss of life is cannot yet be estimated. It is serious in regions that are accessible. What it is in the interior may never be known. The country which was under crop ready for the harvest is now a great inland sea on which junks sail where once villages stood, and communication can only be sustained by boat. Trees are visible and islands are formed by rising ground. On these spots, and along the embankment of the railway between Tientsin and Pukow, are encamped thousands of practically foodless refugees. Those who can manage it are crowding to Tientsin in thousands, and as the weather gets colder, more and more will find their way to where food is available. The country was of course devastated long before Tientsin was menaced, the waters creeping along comparatively slowly. Reports from Chinese sources indicated that the city was in the way of the waters, however, and by September 20 it was regarded as certain that there would be trouble.

The Conditions at Tientsin

By the 23rd it was clear that the menace was grave and by the 24th the waters began to overflow the Japanese Concession. By the 25th the flood had reached the British concession and by the 26th it had attained its maximum. By that time a narrow slip of the British Concession—the principal street, Victoria Road, and its immediate vicinity—was all of the concession which remained dry, the rest being under water. The Japanese Concession and the French Concession were the chief sufferers, there being several feet of water, in places up to ten and more in most of the streets and houses. In the British Concession the depth ranged to six or more feet. Immediately the water began to rise residents in the affected areas improvised rafts or boats wherewith to escape if necessary. Many fled from their residences, but the majority remained. The water rose steadily and without any current, beginning by bubbling up through the drains, through the macadam of the roads, then through the floor boards, spouting through walls and any other obstacles too porous to resist. Knowledge of the immense sea behind soon brought it home to those concerned that the waters were not destined to subside quickly, and arrangements were made for a prolonged siege. Services of boats were provided in due course to serve the various streets. Jetties were made at various points. Junks, barges, sampans, boxes, tin baths, planks, doors, tables, tubs, stools, and anything that would float were pressed into service, and within a few days the populace had practically settled down to their new conditions of life. The occupants of one-storied houses were perforce compelled to move, but they were few, while those in two or more storied houses simply shifted up a stage and continued existence as before, except that freedom of movement outside was restricted.

The flooding of the British Electric Light Plant stopped all electricity the moment the waters rose, and for similar reason the water supply was cut off. Fortunately the French Electric Light Works were built so that the machinery would be above even phenomenal flood level, and the precaution was a wise one, for the works were kept going, and were able to cope with the difficult situation after connexions had been made. The differences in current caused much delay and discomfort, but the streets in the British Concession eventually managed to acquire some illumination, while many houses managed to secure a service.

The danger from insanitary conditions was not overlooked, and regulations were promptly introduced, while steps were immediately taken to provide water from the Chinese mains. For the first day or two, hardship was caused by the shortage of boats; but within a week or two, there were sufficient available to answer all demands, and those who were victims of the water quickly adjusted themselves to the new conditions.

Venetian life seemed popular, and boat loads of gayly-dressed people, both foreign and Chinese, were to be observed on every sunny day rowing about the streets bent on sight-seeing voyages, and generally getting the best out of a bad thing.

Engineers were promptly at work seeking means to avert greater dangers and to cope with the flood. It was quickly made patent that the waters would not subside for months if left to themselves, and the grave perils attendant upon allowing the water to freeze solid in the approaching winter had to be faced. It was therefore decided that the only steps that could be taken to release the main concessions would be to build dykes and pump the water out. Fortunately there were efficient pumps which could be used for the purpose, and a large supply of gunny bags was available for dyke building. Mr. W. M. Bergin, an engineer connected with the Peking-Moukden Railway, was placed in charge of building a dyke round the British Concession, and in short order he had thousands of coolies at work. Earth had to be brought in barges from down river, and a double row of filled bags—about three or four feet apart—had to be laid round the whole concession, the space between rows being filled with earth, carried mostly in boats, sometimes in carts submerged to the axles, and to a large extent in baskets or barrows, carried or wheeled along the newly made dyke. The job was a large and an important one, and proceeded so well that by October 20 it was virtually completed. In the meantime the large dredging pump of the Haiho Conservancy

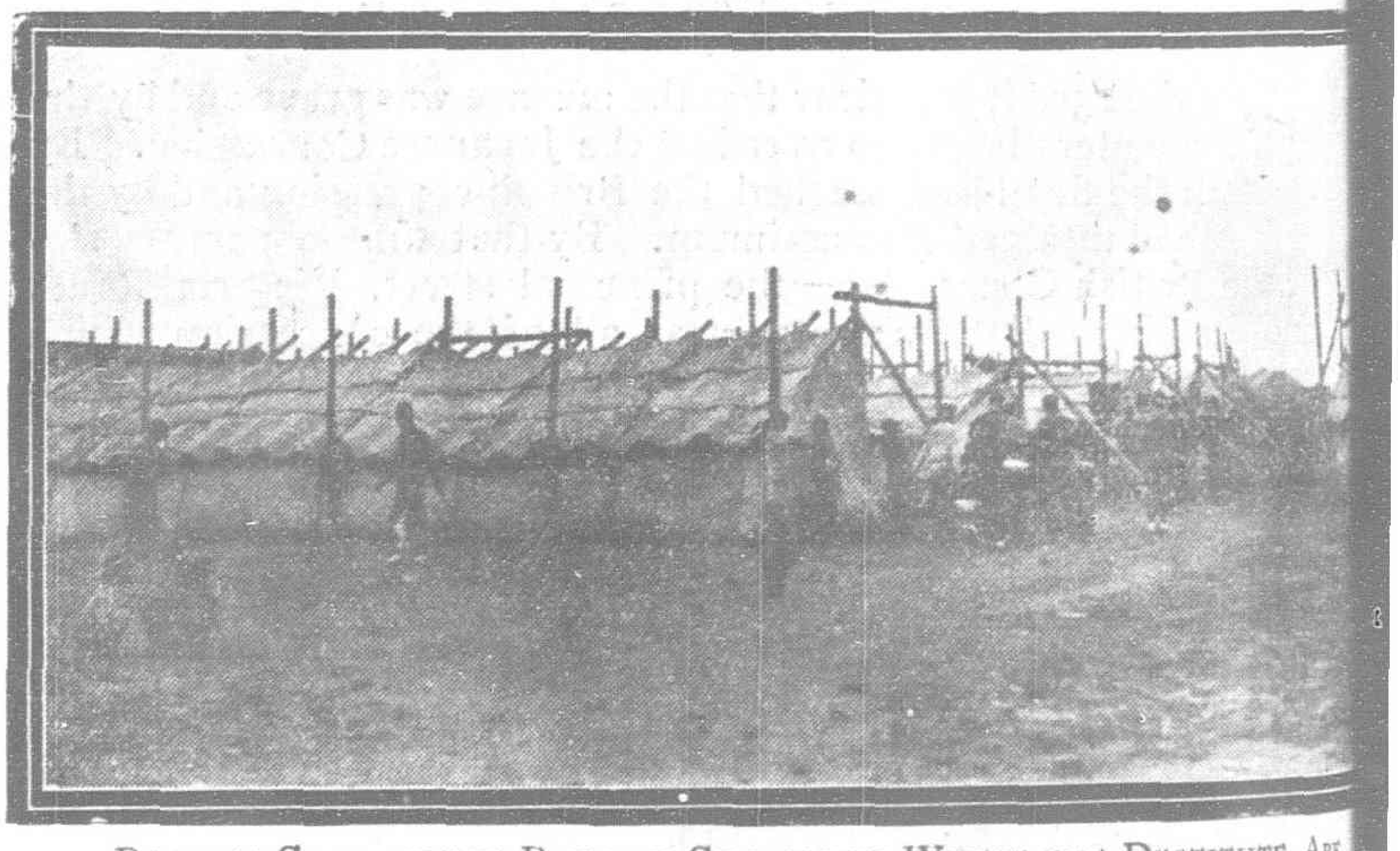
Corner of the Canton Road

A Street in the Native City, Tientsin

Board was got into action, and several other pumps were installed at different points, while thousands of Chinese water lifters were employed to throw water over the dykes in the Chinese manner. French engineers and Japanese engineers dyked in the French and Japanese concessions to some extent, and pumping operations were proceeded with.

One of the worst features of the flood was the influx of refugees from the surrounding country. About 100,000 came in during the first day or two, and the numbers kept increasing. Most of these people had neither money, clothing, nor food. Their houses, made of mud, melted as the waters rose, and left them homeless. They were rescued in boats, or walked before the rising waters into Tientsin, and there they were accommodated in theaters, or encamped wherever they could find spare ground. The problem was one that had to be tackled heroically; and as the housing question, in view of the coming winter, was the most serious one, attention was promptly given to it. There was nothing to do but erect temporary huts to accommodate the homeless; and after much discussion, Mr. Harry Hussey, of the firm of Shattuck and Hussey, architects of Chicago and Peking, who are in charge of the Rockefeller work in Peking, designed a building of reeds and plaster, which could not be bettered as to cheapness of price or comfort at the cost. The American Red Cross Society, through Mr. Roger Green, undertook to build 1,000 such huts, and on October 16, they were commenced, to be completed by October 20. Mr. Hussey personally undertook the planning, the laying out of the sites, the supervision of erection, etc. The huts were built in groups of 12, 21 feet apart, on straight streets 21 feet wide. All the huts face south, and the speciality of the Hussey Hut is that it is about the only "residence" designed that will allow the sun to shine on the ceiling. The price per hut was about $12, silver, and the measurements are 9½ feet by 11½ feet, with 8 feet 6 inches of clearance inside. Each hut contains a kangue for heating, and accommodates five grown people, or a family of seven. There is but one entrance, in the south front; the door is in the center, and on each side is a window four feet in height, extending to the roof. There are modern sanitary arrangements for each section—a section being 120 huts—and a general bathroom in which all the hot water that might be wanted is available. Great care has been given to fire prevention and sanitation. There will also be an adequate water supply and a general hospital.

Pukow Railway. Villagers Cutting Railway at Liang Wang Chuang. These Men Were Fired on by the Station Guard Without Effect.



Refugee Camp in the Russian Concession Where the Destitute Are Granted Relief

The Hussey Hut is made of reeds and mud, supported on light timber, and the shape of it is one of its distinguishing features. Its roof and northern wall, and therefore its ceiling inside, is all one piece. The reeds are carried from a light beam 8½ feet high in a graceful bend to the ground, over two other light timbers,—the measurement from rear wall to doorstep being 11½ feet. Both the inside and outside of the walls are plastered, and will thus keep out the cold and retain the warmth. The occupants of each hut will do their own cooking, and the fire thus used will contribute to the warming of the room. The kangues will be of brick, but the floors will be tamped clay, which in the dry climate of North China will soon become hard and free from moisture.

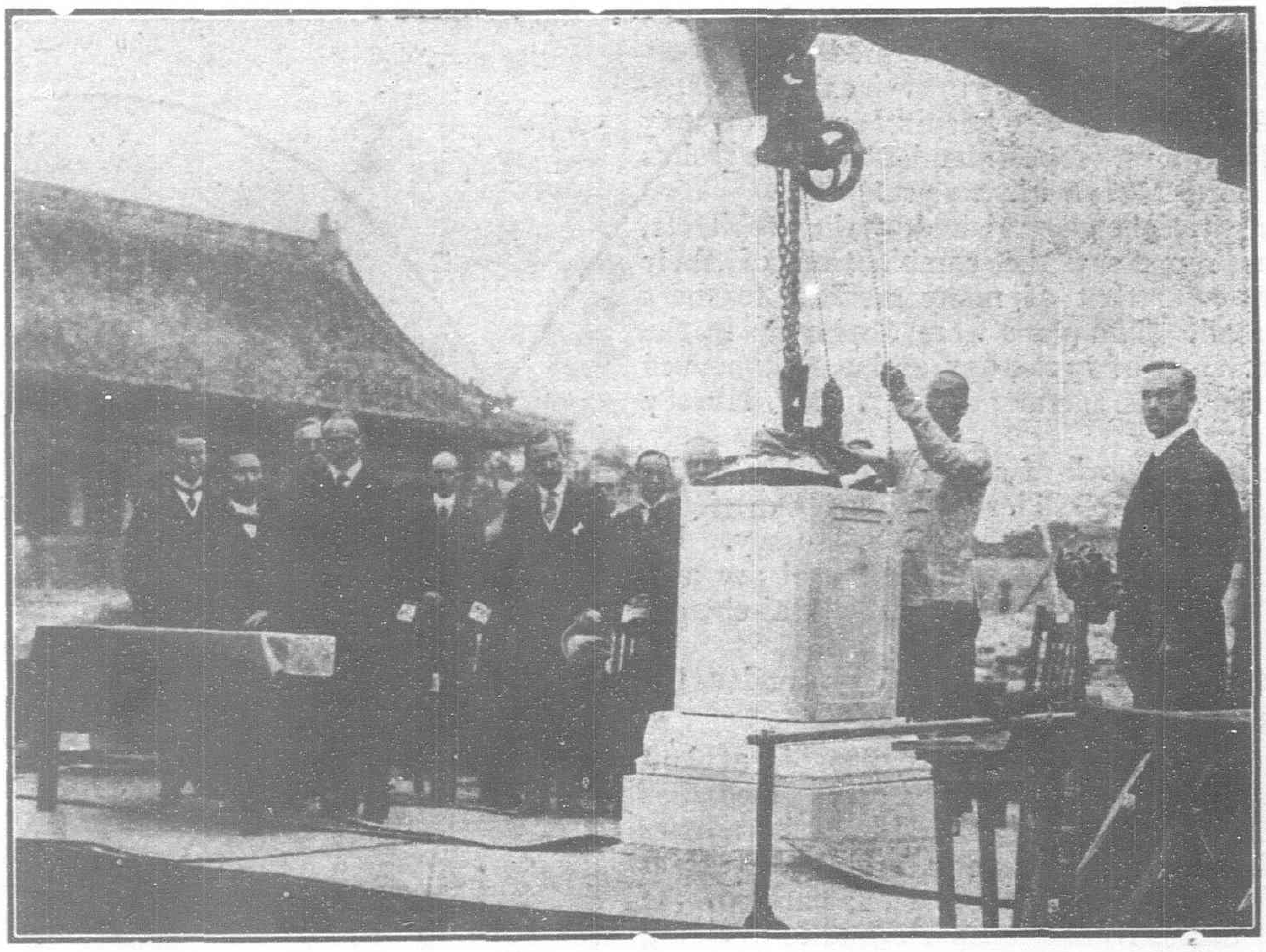
The model of the Hussey Hut will henceforth be generally adopted by the Chinese and other communities participating in the relief work, and it is expected that some 8,000 will be erected before the cold weather sets in.

Great Building Scheme of the Rockefeller Foundation

China Medical Board Will Spend over $2,000,000 Gold Erecting a Medical College at Peking

In accordance with the plans announced some time ago for the development of medical education in China, under the auspices of the China Medical Board of the Rockefeller Foundation, construction of the new buildings of the reorganized Peking Union Medical College is now under way, and instruction in the Pre-Medical School, or preparatory department of the college, has begun.

The Pre-Medical School was opened on September 11, 1917, in Lockhart Hall, the building of the Union Medical College, located on Hatamen Street. The purpose of this school is to prepare students for the courses of the Medical School, and the courses offered are planned for that purpose. Students are admitted to the Pre-Medical School on examination, only those students who have graduated from middle school being admitted to examination. As all instruction is in English, with the exception of that in Chinese composition and literature, only those who can already read, write, and speak English are admitted. A three years' course in English, Chinese, mathematics, physics, chemistry, and biology is offered. The laboratories have been newly and completely equipped, and instructors have been selected and appointed especially for the work of the school. The courses offered are strictly of college grade. The requirements for admission to the Medical School will be as high as in the highest grade schools abroad, and the Pre-Medical School furnishes the preliminary education required.



Laying the Foundation Stone of the China Medical College at Peking, on September 24, 1917. Standing at the Table Is Dr. Paul Reinsch. American Minister. To the Left of Dr. Reinsch Is the Chinese Minister of Education, Who Laid the Stone. With His Hat in His Hand Is Mr. Bielby Alston, the British Charge des Affaires. On the Extreme Right Is Mr. Bennett, Who Is in Charge of the Construction Work.

The staff of the Pre-Medical School at present under appointment consists of:

Charles W. Young, B.S., M.D., Dean.
William Warren Stifler, Ph. D., Instructor in Physics.
Stanley D. Wilson, Ph. D., Instructor in Chemistry.
Ma Kiam, Hsiu-tsai, Instructor in Chinese.
Luther Carrington Goodrich, A.B., Instructor in English.
C. T. Feng, Assistant in Chemistry.
Y. T. Tong, S.B., Assistant in Physics.

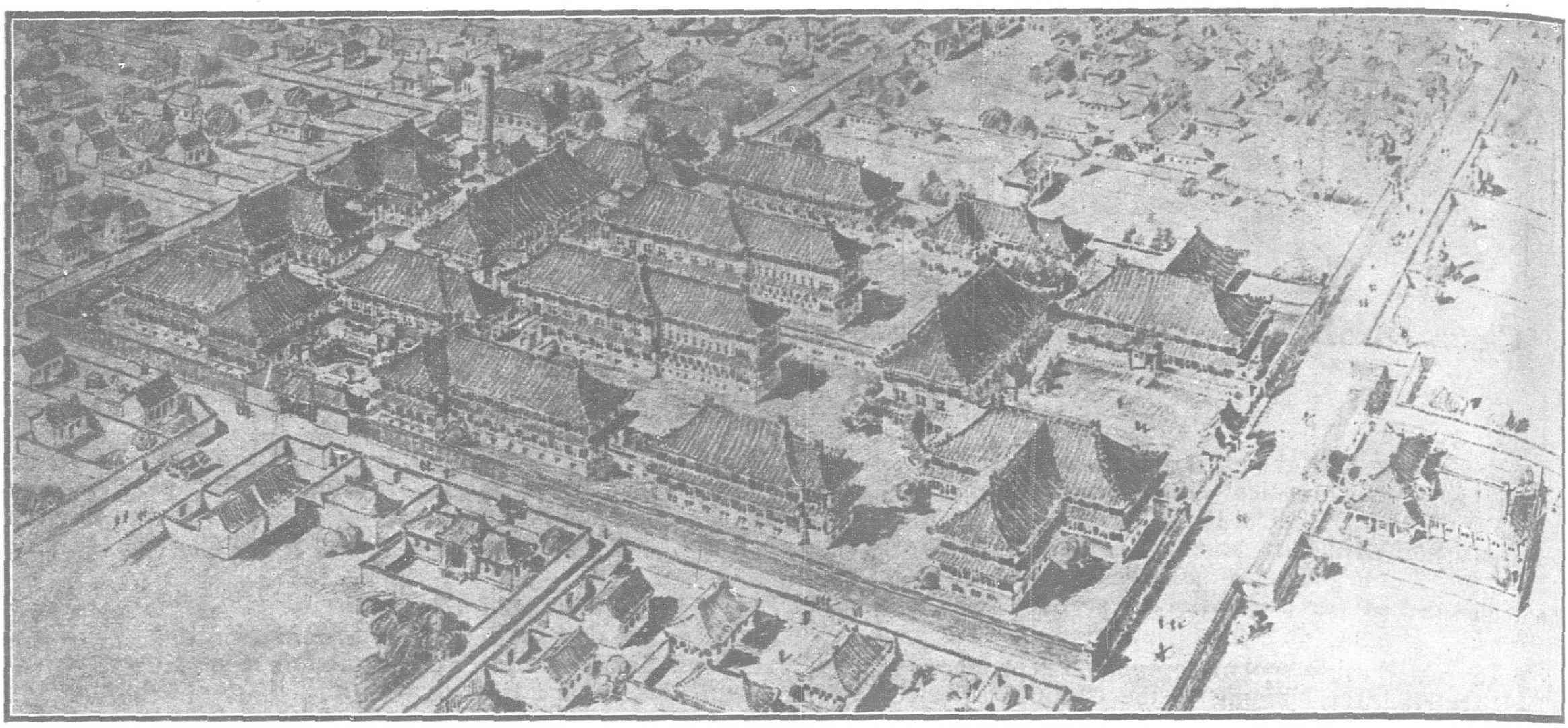
It is planned to open the Medical School for the admission of students in September, 1919, in the new buildings now under construction. In the meantime, organization of the medical faculty and hospital staff is proceeding under the direction of Dr. Franklin C. McLean, professor of medicine and physician in chief, who was appointed as executive head of the institution in 1916.

The buildings and equipment of the institution will be complete and modern in every respect, and an adequate teaching staff will be brought to Peking. The members of the staff will devote their entire time to the work of the institution. The standard of work will be in every respect equal to that of the best schools abroad, and it will no longer be necessary for Chinese students to go abroad to obtain a first-grade education in modern scientific medicine and surgery.

Ground was broken early in September, 1917, for the new buildings, and the corner stone was laid, with appropriate ceremonies on September 24. 1917, by His Excellency, the Minister of Education, Mr. Fan Yuan-lien. It is expected that the first group of buildings will be completed by the fall of 1918, and that the entire plant, including the hospital and out-patient department, will be ready for occupancy by the fall of 1919.

The new buildings are located in the former Yu Wang-fu, in Santiao Hu-tung, between Hatamen Street and Wang Fu-ching Street (commonly known as Morrison Street). Access is also had to the property from Morrison Street through the wide Shuai Fu-yüan. The main entrance to the hospital is to be through this street. This property, formerly the palace of a Manchu prince, consists of approximately ten acres of land. It will be devoted to the buildings necessary for instruction and hospital purposes. Other buildings, such as dormitories and residences, are being built on other property belonging to the college.

A great deal of study has been devoted to making this plant ideal from the standpoint of medical teaching. In the summer of 1916, Mr. Charles A. Coolidge, architect, of Boston, Massachusetts, an architect of wide experience in hospital and laboratory construction, was retained as consulting architect, and visited Peking at the request of the China Medical Board. Mr. Harry H. Hussey, of the firm of Shattuck and Hussey, architects,



VIEW OF CHINA MEDICAL BOARD BUILDINGS, LOOKING NORTHWEST

Chicago, Illinois, with offices in Peking, was retained as architect to prepare the plans and specifications, and supervise the construction of the buildings. As a consultant in hospital and laboratory design, Dr. Winford H. Smith, superintendent of the Johns Hopkins Hospital, Baltimore, Maryland., was retained.

Various teaching institutions were visited by the architects, and the approved plans represent the combination of their experience and judgment with that of many medical teachers and hospital men consulted. The plans were drawn up in the United States during the winter of 1916-1917, and were approved and construction authorized by the summer of 1917. Mr. Hussey returned to Peking in July.

To superintend the actual work of construction, Mr. B. E. Bennett, of Baltimore, Maryland, a builder with much experience in the erection of large plants, was engaged by Mr. Hussey. He came to Peking in August. The China Medical Board are also fortunate in securing the services of Mr. Whang Hai-chen to assist Mr. Hussey in his work.

The building operations are being carried on under the supervision of a number of foreign superintendents.

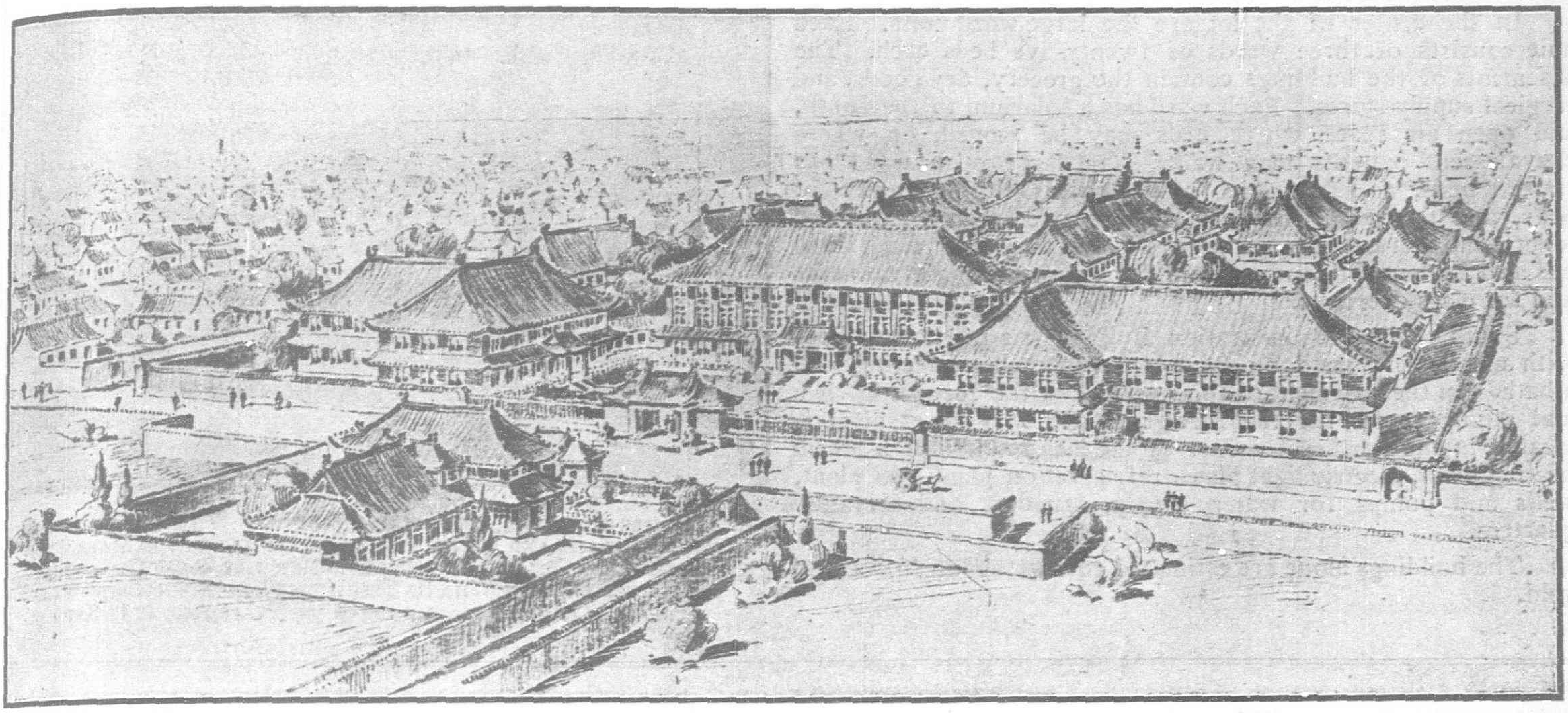
The buildings were planned especially to provide a plant that would be modern in every respect. The hospital embodies the most approved ideas in hospital design, and the laboratories are planned for convenience in teaching and research. A great deal of study was devoted to making the various parts of the institution convenient of access from other parts, and to avoiding duplication. Economy in administration was always considered. The buildings are placed so that every part of each building is well lighted and ventilated. Although the first consideration in planning the buildings was always the use to which the building was to be put, and although all modern ideas of sanitation, heating, and ventilation were embodied, it was found possible to use Chinese materials almost exclusively. The buildings are to be of fireproof construction, of brick and reinforced concrete, and with tile roofs.

An adaptation of Chinese architecture was adopted. This does not mean merely putting Chinese roofs on foreign buildings, but the entire design was adapted to conform to Chinese architectural lines. The result is a design that is pleasing to Chinese and foreigners alike. The beauty of the buildings is increased by a Chinese treatment of courtyards, carved balustrades, gateways, and walls.

Description of Buildings

Facing the main entrance to the lot, from the south, and across the street (San Tiao Hutung) is the Chapel. This building will have an auditorium seating 450 people, students' club-

MR. HARRY HUSSEY, ARCHITECT, WHO DESIGNED THE BUILDINGS



Perspective View of China Medical Board Buildings, Looking Northwest

rooms and reading rooms, and living quarters and an office for the director of religious work. This building is in pure Chinese style, with wooden columns and willow-pattern windows.

The southern part of the lot is devoted to the departments of anatomy and physiology, including pharmacology and physiological chemistry. One enters from the south into a large court, on which three buildings face. Surrounding the court, and in front of the three buildings, is a terrace, with a carved marble balustrade.

Facing the court from the west is the Anatomy Building, two stories high. This building is devoted to gross and microscopic anatomy. Opposite this building is a building exactly similar in outside appearance, devoted to physiology and pharmacology. The center building of the group houses the library, the offices of the Medical School, the laboratories of physiological chemistry, and the general laboratory supply rooms. From this building is a corridor, which connects the group of three buildings with the hospital group.

The hospital entrance is at the end of Shuai Fu Yüan, on the west side of the lot, looking towards Morrison Street. Through this entrance another large court is reached, on which three buildings face. On the north of the court is the Nurses' Home, a building devoted to the housing and instruction of women nurses. Opposite this building, on the south of the court, is the Administration Building, containing the offices of the administrative officers of the institution, and consultation offices of the hospital staff, and living quarters for resident physicians and internes. On the east is the building through which patients are admitted to the out-patient department or to the hospital. The basement has an ambulance entrance, emergency dressing rooms, pharmacy, and admitting wards for the temporary care of patients. The first floor has the offices of the out-patient department, and the out-patient department of the department of gynecology and obstetrics. The second floor is devoted to wards for children, and the third floor to obstetrics.

Immediately east of the last building described, and joining it with corridors on every floor, is the large central building of the hospital group. The basement of this building houses the Chinese kitchens, with cold-storage rooms and rooms for the preparation of food. There is a diet kitchen for the preparation of special diets. Dining rooms for the resident staff of the hospital are also here. On the first floor is the out-patient department. There are special quarters for general medicine, general surgery, pediatrics, neurology, skin and syphilis, orthopedic surgery, genito-urinary surgery, eye, ear, nose and throat. Numerous examining rooms and treatment rooms are provided in each department, and there are accommodations for over 200 waiting patients.

On the second and third floor of this building, which is connected with the ward units on each floor by inclosed corridors, are the laboratories and classrooms for teaching clinical medicine, surgery, and gynecology and obstetrics, the X-ray department, and laboratories for research. The fourth floor is entirely devoted to the operating rooms of the hospital.

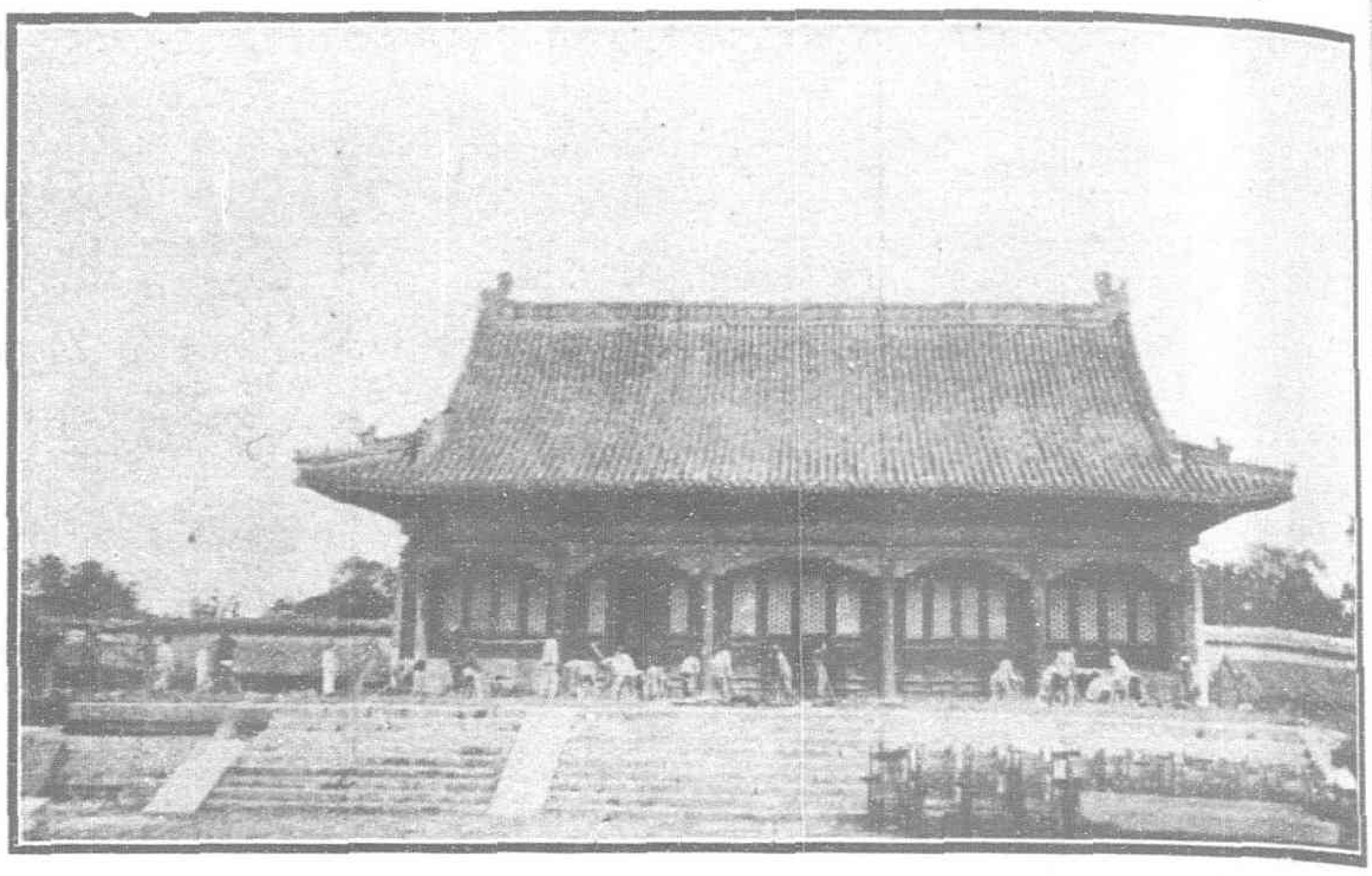
Connecting with this building on the east is the Pathology Building, with every facility for teaching and research in pathology, bacteriology and hygiene, parasitology and public health. In close connection is the animal house, for breeding and keeping animals to be used for experimental purposes.

Mr. B. F. Bennett of Baltimore, Who Is in Charge of Construction Work

In the center of the lot are the large ward units. Each unit consists of three wards of twenty-five beds each. The basements of the buildings contain the grocery, dry goods, and surgical supply stores. Each ward has a solarium to the south, and open air space where beds may be moved, or where convalescent patients may walk. The large open ward has sixteen beds, and there are smaller rooms with five, and two, beds, and two with one each. The service rooms, baths and toilets, and diet kitchens are modern in every respect. Each ward has also a laboratory and a room for administering treatments and for class exercises.

South of the Administration Building is a private pavilion, with nineteen rooms for private patients, each connecting with a bath. In the basement of this building is the foreign kitchen and dining rooms for the foreign staff. The power plant is located in the northeast corner of the lot, and houses a steam heating plant, electric light plant, refrigeration plant, gas plant, wells and pumps for water supply, laundry, and servants' quarters.

The buildings alone are estimated to cost about $2,000,000 gold.



An Example of the Massive Chinese Buildings Which Comprised the Prince's Palace, and Which Are Being Demolished to Make Room for the New College. The Buildings Provide Great Quantities of Material Which Will Be Used in the New Structures. The Palace Was Erected Some 200 or 300 Years Ago, It Is Said.

Returned Chinese Students

Filling High Positions in China

A recent census of the Chinese in Peking who are returned students from foreign countries—those who have studied in Europe, America, and Japan—shows that there are nearly 950 accounted for in the metropolis and that of these 806 are employed by the government departments, while most of the others are teachers in schools and universities, and a few are in business. They constitute 23.2 per cent of the total number of departmental officers, experts, and clerks, and in certain departments, such as the department of agriculture, where special training is particularly valued, they number nearly half the total roll of employees.

America has a national interest in the welfare of the returned students, for that part of the Boxer Indemnity remitted in 1908 is being spent by the Chinese Government in American scholarships for Chinese students, and the Tsing Hua College in Peking, which prepares students for foreign universities, is kept up out of the same fund. This has not only been the direct cause of taking many young Chinese to America, but it has also stimulated the emigration of ambitious and scholarly young Chinese to many lands, and has undoubtedly had its effect upon China's attitude towards Occidental nations and their civilization. At the time that America announced her intention of returning the surplus indemnity funds, the Chinese were profusely grateful, and America's moral stock went up rapidly and permanently in China. Other nationals in the Orient felt that America had done something very shrewd and businesslike, for the nation not only won the gratitude of the Chinese people, but also undertook to train some hundreds or thousands of promising young Chinese, who would be almost certain to return to official positions in their native land, and who would carry with them a prejudice in favor of America, American goods, and American mechanical equipment for any public work. Time has since shown that, whether the unique decision of the United States Government was inspired by sentimental and benevolent motives or by business foresight, students returned from America exercise an influence in governmental matters and contrive to find good government jobs for themselves, of which the returned students from all other nations are envious.

Out of the total number of returned scholars now living in Peking considerably more than half are graduates of Japanese schools. Their influence in Japan's favor is not trifling. Japan is close at hand, few restrictions are placed upon immigration, and both living and schooling are cheap. To the poor student it is the only resource outside his own country, where educational facilities along Western lines are still embryonic. A Japanese education, whatever its merits may be, seems to be accepted by those of little means as a less attractive but necessary alternative when they cannot devise means of reaching Europe or America.

Japan has returned to Peking 522 students. Of the balance 154 are American graduates, 99 British, 52 French, 47 German, 38 Belgian, 9 Austrian, 7 Russian, 1 Spanish, and 1 Turkish, in addition to which there are many who have pursued nondescript courses in their travels in many lands. America, though notoriously expensive, is second to Japan in the number of her graduates. University students in America often wonder, no doubt, what becomes of the Chinese who go through the classical and technical courses with them, taking it all so seriously, looking with such large eyes upon the strangeness of Occidental life, and disappearing, seldom to reappear, the day after Commencement. It might be some satisfaction to these people to know that their classmates, in a big percentage of cases, return and step into fat government jobs—fat as things are reckoned in China—with lofty titles and stilts of dignity, jobs which in the West fall to the talented and fortunate after a lifetime of hard work and political warfare. It has not always been so in China. Under the Manchus the students were used when their technical training made their services indispensable, but the sage old Confucian scholars who sat in the high places, with the rust and dust and mold of four thousand years heaping up about them, mistrusted this "fly-up-the-creek" breed that came strutting back from abroad in barbarous clothes, gibbering in barbarous tongues, and shouting diatribes at all that the traditions of ages heaped upon ages made holy and sacred.

Among those who fail to get appointments or to hold them, there is still some talk of unfair discrimination, and those who receive nothing better than clerkships complain that their salaries are less than were their spending allowances in America. Whatever there may be in these plaints, it is certain that the case of the students in this generation is better than it was in the days when Tang Shao-yi and his colleagues returned. In the present administration Dr. Chen Chin-tao, Minister of Finance, is a graduate of the University of California, and a

Ph.D. of Yale. The President's secretary, Kuo Tai-chi, is a graduate of the University of Pennsylvania. Wu Chao-chu, Councillor of the Ministry of Foreign Affairs, began his education in the Atlantic City High School when his father (Dr. Wu Ting-fang) was Minister to the United States. C. T. Wang, Vice-Speaker of the Senate, studied law in America for three years. Hsiang Hsiang, councillor of the Ministry of Finance and a member of the Bank of China's executive committee, is a student from Columbia. Ex-Minister Chen Chen-hsien is a graduate of the University of California. Chow Tze-chi, who recently resigned from the Ministry of Agriculture and Commerce, because of his affiliations with the monarchists, was a leading political figure in Peking during Yuan Shih-kai's régime. He is an American returned student and he was also an envoy to America in 1910, when he accompanied the Chinese Naval Mission. A complete census of all the returned students in China has never been taken, and the list of those in Peking is not complete, but such as it is, the students make an excellent showing.

Among all the returned students holding office in Peking, the oldest is 67 and the youngest 21, while the average seems to be about 33. In the Ministry of War 34.1 per cent of the officials are returned students, in the Ministry of Education 28.8 per cent, in the Forestry Bureau 32.2 per cent, in the Ministry of Commerce 48.6 per cent, in the National Supreme Court 40 per cent, and in the Ministry of Communications 46.7 per cent. The greater part of these students, contrary to general preconceived ideas both in China and abroad, are not from Canton or its neighborhood, but from the province of Kiangsu, that is, from the Shanghai-Nanking district. Kiangsu has 208 returned students in Peking, Chekiang 143, Hupeh 117, and Canton, or more exactly the province of Kuangtung, 79.

A comparison of the studies pursued by these students abroad is extremely interesting, showing, as it does, the trend of Chinese ambition and young China's idea of usefulness. Of the students in Peking 139 devoted their time abroad to the study of military affairs, 56 went in for engineering, 79 for law, 61 took commercial courses, 34 studied agriculture or forestry, 30 studied finance, 28 studied medicine, and the rest are scattered through a score of special branches nearly all more or less technical. Out of the whole lot only 15 were interested in literature and 1 in art. Another interesting fact is that from more than 950 who have spent an average of four years abroad, only 135 are now Christians: this in spite of the fact that a very fair percentage received their preparatory training in missionary schools in China.

The following is a list of the students returned from America, now resident in Peking. As it was completed before the reconvocation of the National Assembly and the recent changes in the government, many names of government officers who are now temporary residents are omitted:

Wang Pi, Cornell M. E., Peking-Kalgan Railway.
Wang Wen-huei, 34, Chief of Postal Department, Ministry of Communications.
Wang Ren-fu, 32, Harvard B.A., Professor in Peking Government University.
Wang Chen-fu, 27, Columbia M. A., Fengtien Coal and Iron Mines.
Wang Chen-tse, Peking-Kalgan Railway.
Wang Chien-tse, 37, California B. Sc., Prof. Peking Government University.
Wang Yin-tse, 33, Chicago and Harvard, Salt Gabelle.
Wang Chia-luen, 33, New Bradford, Commissariat Dept., Ministry of War.
Wang Chin-chung, 33, Illinois and Yale, Dept. Chief, Ministry of Communications.
Wang Fu-chang, 44, Junior Secretary of Foreign Office.
Wang Shao-yin, 26, Col. School of Mines, Prof. Peking Govt. University.
Wang Lin-kuo, Ex-Commissioner Foreign Affairs, Tientsin.
Pien Fu-sun, 31, Brown, Bank of China.
Pien Shou-sun, 32, Brown, Chief Accountant, Bank of China.
Wu Chao-chu, 29, Atlantic City High School, Councillor Foreign Office.
Chu Fu, 26, National Oil Administration.
Chu Wen-chin, Cushing Academy, American Board Mission School.
Chu Wen-hun, 28, Chinese Y. M. C. A.
Chu Chao-hsin, 37, Columbia, Senate.
Chu Shen-en, 38, Translation Bureau, Ministry of Finance.
Chu Tsu-hung, 34, Penn. B. Sc. Senior Clerk, Ministry of Communications.
Jen Chuan-pang, 37, Illinois B. A. Expert, Ministry of Communications.
Yuan Chih-tao, 33, Civil Dept., Ministry of Justice.
Shen Ai, 34 Cornell M. E., Supt. Tangshan Manufactory.
Yu Chien-fu, 31, Ministry of Navy.
Wu Nai-chen, 35 California M. A., Dept. Chief, Ministry of Finance.
Wu Tsu-yao, 26, Wisconsin M.Sc.
Wu Ching-tu, 28, Illinois M.Sc., Ministry of Communications.
Wu Pao-hsien, 37, Senior Clerk, Ministry Foreign Affairs.
Wu Ying-ku, 59, Chief Accountant, Ministry of Communications.
Ho Ling, 30, Penn. M.A., Railway Accounts Bureau, Ministry of Communications.
Ho Chi, 27, Lehigh, M.S., Prof. Peking Govt. University.
Ho Ling-yi, Dartmouth. Prof. Tsing Hua College.
Li Sung-tao, 26, Columbia M.A., Prof. Tsing Hua College.
Li Kuo-chi, 30, Harvard M.A.
Li Min-ho, Wisconsin, Ch.E., Han Yang Iron Works.
Shao Chiang-kuang, 33, Junior Clerk, Ministry of Finance.
Ju Jen-hao, 34, Harvard B.Sc., Bureau of Rites and Ceremonies.
Li Kung, Peking Industrial and Engineering College.
Chin Tai, 33, Harvard B.A., Compilation Bureau.
Chin Pang-chen, 27.
Chou Tien, Cornell M.E., Ministry of Agriculture and Commerce.
Chou Tze-chi, 38, Ex-Minister of Agriculture and Commerce.
Chou Szu-chin, 24, Yale, Prof. Peking Government University.
Chou Kuo-hsien, 32, Chicago, Commissioner, Ministry of Finance.
Chou Yi-chung, 33, Yale D. Litt., President Tsing Hua College.
Chou Hsien-hsien, 27, Mass. Tech. B.S., Technical Expert, Peking Municipal Council.
Chou Wan-pang, 54, Dept. Chief, Ministry of Communications.
Lin Liang-kung, 32, Cornell B.A., Bank of China.
Hu Yi-kuo, 41, Illinois Ll.B., Judge of Supreme Court.
Hu Hung-yu, 28, Penn., Railway Accounts Dept., Ministry of Communications.
Hsi Teh-pin, 26, Mass. Tech. B.Sc.
Ma Ying-tse, 33, Ph.D., Ministry of Communications.
Sze Sun, Peking Industrial and Engineering College.
Sze Shao-chi (Alfred Sze), Cornell, Minister to England.
Tze Yu-ying, 33, Penn. B.S., National Oil Administrations.
Liang Tung-yen, 34, Ohio B.A., Ex-Minister to U.S. Ex-Minister of Communications.
Kuo Tai-chi, 28, Penn. B.S. Secretary, President Li Yuan-hung.
Hsu Chih, 35, Columbia Ph.D., Ministry of Communications.
Hsu Chih-cheng, 27, Chicago M.A., Prof. Tsing Hua College.
Hsu Chuan-hsiang, 35, Yale Ph.B.
Hsu Chun-ching, 38, M.A., President University Preparatory School.
Hsu Wei-chin, 35, Chicago Ll.B., Supreme Court.
Lu Hsiu-chin, 31, Wisconsin B.A., Ministry of Justice.
Lu Mou-teh, 33, Ohio M.A , Ministry of Education.
Lu Pao-kan, 31, Ministry of Agriculture and Commerce.
Hsia Yuan-piao 32, Prof. Peking Govt. University.
Chen Shih-ti, 34, Harvard, Board of Audit.
Chen Tsai-shen, 37, Columbia M. A., Prof. Methodist University.
Chen Tung-shou, 37, Illinois M.A., Ministry of Communications.
Chen Huen-lai, 32, M.A., Prof. Peking Govt. University.
Chen Tao-yuan, Salt Gabelle.
Chen Fu-hsi, Cornell B.A.
Chen Wei-ping, 40, Boston Ph.D. Teaching.
Chen Chin-tao, Yale Ph.D., Minister of Finance.

Sun Hun, 36, Harvard M.A., Bank.
Sun Yuan-feng, 33, Bank of China.
Sun Chia-lo, 31, Ministry of Communications.
Sun Pao-chien, 30, Peking Telephone Company, Ministry of Communications.
Tang Yu-hen, 31, Ministry of Agriculture and Commerce.
Tang Yu-liang, 27, Princeton M.A., Prof. Tsing Hua College.
Tang Yung-tse, 28.
Wei Yi-pei, 32, Cornell M.E., Ministry of Communications.
Yao Chun-ling, Banque Industrielle de Chine.
Tsia Chung-lin, 26, Wisconsin B.A., Tung Wei Industrial Co.
Ling Chih-hung, 28, Stanford, Ministry of Interior.
Kao Lun-chen, 31, Ministry of Communications.
Tseng Kuang-hsiang, 30, Penn. M.A., Ministry of Communications.
Huang Pei-cheng, Cornell M.A., Ministry of Agriculture and Commerce.
Huang Chin-hsia, 29, Columbia M.A., Peking Normal College.
Huang Kuo-yin, 30, Wisconsin Ll.B., Ministry of Agriculture and Commerce.
Huang Yun-ling, 41, Baker M.A., Ministry of Foreign Affairs.
Huang Pao-nan, 33, Columbia M.A., Ministry of Agriculture and Commerce.
Chang Yuan-chuan, 23, Cornell B.A., Prof. Peking Govt. University.
Chang Tsung-yuan, 39, California B.Sc., Financial Commission.
Chang Tsu-shun, 32, Cal. B.Sc., Min., Agriculture, Commerce.
Chang Ta-chung, 34, Yale Ph.B., Prof. Peking Govt. University.
Chang Cheng-chi, 28, U. of Penn., Board of Audit.
Chang Hsin-liang, 30, M.A., Ministry of Finance.
Chang Chuan-yang, 27, Cornell M.E., Prof. Peking Govt. Uni.
Chang Yu-chuen, 37, Yale LL.M., Ministry of Foreign Affairs.
Chang Teh-hsi, Salt Gabelle.
Feng Ching-kuei, 37, Cornell Ph.D., Prof. Peking Govt. University.
Tsao Chih-i, 55, M.D., Doctor Peking-Hankow Railway.
Hsu Tsung-han, 35.
Hsu Chu-shih, 32, Penn. M.A., Salt Gabelle and Bureau of Rites and Ceremonies.
Mei Chi-ming,
Mei Ti-chi, 37, Worcester M.S., Prof. Tsing Hua College.
Yeh Ku-liang, 35, Secretary of Foreign Office.
Fei Chi-hou, 33, Yale M.A., Chinese Y. M. C. A.
Fei Hsing-jen, 29, Yale M.A., Teaching.
Tang Sung, 36, Michigan B.A., Hen Feng Cotton Mill.
Cheng Kung-yin, 31, California M.S., Min. of Communications.
Wen Tsung-yu, 36, Prof. Peking Govt. University.
Chuang Chun, 28, Illinois B.S., Tsing Hua College.
Hsiang Hsiang, 37, Columbia M.A., Ministry of Finance.
Yang Wen-lien, 38, Albany, Board of Audit.
Yang Yin-chung, 40, Penn. B.S., Prof. Tsing Hua College.
Yang Yin-chan, 39, Bureau of Rites and Ceremonies.
Yang Pao-ling, National Conservancy Bureau.
Yang Yin-hang, 39, High Procurate.
Yang Yin-yueh, 27, Wis. M.A., Ministry of Communications.
Yu Chen-yung, 27, Prof. Tsing Hua College.
Lei Chung-yun, 36, Kentucky C.E.
Tung Yuan-chung, 38, Penn. M.S., Ministry of Communications.
Tung Hsien-kuang, 29, Columbia M.A., National Oil Administration.
Chuen Tien-yu, Ministry of Communications.
Chao Kuo-tsai, 37, Wisconsin M.A., Vice President, Tsing Hua College.
Chao Tsing-chien, 35 Penn. M.A., Dept. Railway Accounts, Ministry of Communications.
Teng Chih-yi, 29, Wisconsin M.S., Ministry of Agriculture and Commerce.
Chen Huai, 31, Boston B.S. Technical Expert, Ministry of Agriculture and Commerce.
Chiu Chang-yung, 27, B.A., National Oil Administration.
Liu Chien, 37, Columbia M.E., Engineer Hunan Mines.
Liu Chi-chih, 30, Wash. B.A., Ministry of Agriculture and Commerce.
Liu Chin-shan, 33, Penn. M.A., Technical Expert, Ministry of Communications.
Liu Chu-hsien, 29, Cornell B.A., Ministry of Interior.
Hsiung Chung-chih, 33, Columbia M.A., National Oil Administration.
Tsai Ting-kan, 55, Co-Director General Customs House Administrations, Vice-Chairman Bureau of Rites and Ceremonies, English Secretary to late President.
Chien Fang-shih.
Chien Tou-ting, 35, Columbia M.A., Salt Gabelle.
Lu Chun, 34, Ministry of Education.
Lu Ting-chun, 37, Formerly with Tientsin-Pukow Railway.
Chih Chen-sun, Stanford B.A., Prof. Peking Govt. University,
Hsieh En-lun, 30, Cornell M.Sc., Technical Expert, Ministry of Agriculture and Commerce.
Chung Ao, 27, Columbia E.E., Training Institute, Ministry of Communications.
Chung Shih-ming, 37, Harvard B.Sc., Salt Gabelle.
Han An, 35, Cornell, M.S., Ministry of Agriculture and Commerce.
Yen Hao-ling, 38, Columbia Ph.D., Ministry of Foreign Affairs.
Tan Fu, 28, Ll.B., Chinese Y.M.C.A.
Tan Huai, Bank of China.
Lo Wen-pei, 28, Ministry of Agriculture and Commerce.
Lo Kuo-jui, Ministry of Communications.
Lo Wei-chiao, 27, Ministry of Navy.
Lo Ting-yu, Prof. Peking Technical College.
Ku Tsung-lin, 29, Penn. M.A., Ministry of Communications.
Ku Teh-ching, Technical Expert, Ministry of Communications.

RESTRICTED SUPPLY OF ELECTRIC CURRENT AT HONGKONG

A public service corporation rarely is able, as the result of a year's business, to declare a dividend of 30 per cent on its capital stock, place one sixth of the amount of its paid-up capital to increase its reserves, write off its plant account more than one third of the amount of its capital stock, and be compelled to call upon its patrons, the public, not to use its product so freely. Nevertheless, according to Consul General George E. Anderson, this is the record of the Hongkong Electric Co. (Ltd.), which supplies electric light and power for the principal portions of the colony as distinct from another concern which serves Kowloon and the mainland of the colony. The unusual business condition arises from the great increase in the use of electric light by Chinese residents of Hongkong, and from the inability of the company to obtain the equipment needed to complete a new plant it has had under construction. Apparently no effort has been made by the concern to get the equipment in the United States.

There has been such an increase in the demand for current during the past year that the company announced some time ago that it would receive no new applications for electricity after the first of January, this year, until its new plant was completed and it was in a position to care for the new business. In spite of this fact, however, the demand on the company for service has increased to such a point that it has been compelled to advertise in the newspapers asking patrons to use current sparingly between the hours of 6 and 10 p.m. daily.

The company's financial returns for the past year, as set forth in the report to the stockholders at the annual meeting on May 5, showed net profits amounting to $509,941, to which is added $110,558, the balance brought forward from the last account, making a total of $620,499 available for appropriation, disposed of as follows, with the amounts in Hongkong currency (dollar=$0.63 United States currency): To pay a dividend of 22½ per cent, $2.25 per share on 60,000 shares, $135,000; to pay a bonus of 75 cents per share, $45,000; to place to reserve, $100,000; to write off plant account for depreciation, $175,000; to write off new property account for depreciation, $40,000; to write off furniture account for depreciation, $392.10; to pay a bonus to staff, $11,357.15; to carry forward to next account, $113,750.11; total, $620,499.36.

Report on the Yangtze Estuary

[By H. von Heidenstam, Engineer-in-Chief, of the Whangpoo Conservancy]

A memorandum on the need of an investigation of the Yangtze Estuary was submitted to the Board by the writer on May 1st, 1914. After careful consideration and consultation with the Consultative Board, whose unanimous approval was obtained, authority to proceed with the investigation was given by the Board on the 17th June.

Briefly it may be said that the general aim of the enquiry, as outlined in the above memorandum, was of a twofold nature:

To consider the effect of the Yangtze Estuary upon the Whangpoo, its general regimen and its debouchure into the Yangtze.

To analyse as far as may be the problem of the stability and future developments of the Yangtze Estuary between the mouth of the Whangpoo and the sea, more especially in the main or so-called "Southern" Channel.

This somewhat lengthy report has been prepared in its present form to systematize, and co-ordinate in a handy manner, the large amount of information and material collected, which, of course, is all on file in this office but in less digestible form, and to show the results (positive or negative, as the case may be) of the investigation, in the hope that such material and results may form the necessary basis for later comparative study and eventual conservancy work in the Whangpoo or even in the Yangtze itself.

The almost entire absence of concise information regarding early conditions has made impossible any accurate comparisons of the present with remote periods, which, of course, would have been most interesting and instructive.

For the purpose of this investigation the estuary proper of the Yangtze has been considered to begin at Kiangyin and to extend to the sea towards the neighbourhood of the Saddle Islands. The former point appears as the natural beginning of the estuary proper, as it is the last "pass" where the position of the stream is definitely fixed, and the river above it follows only one fixed bed and channel. From Kiangyin outwards large changes are possible and do occur, regularly or irregularly, as the case may be. Further, Kiangyin represents the summer limit at high river of upstream tidal currents.

Within this area of the estuary proper, data has been collected on the matters considered necessary as far as feasible.

Outside the estuary the work has been confined to the acquisition of such information as is necessary to realize the character of the river as a whole. Such work has chiefly been limited to the following two headings:—

A study of the region (up to Wuhu) within which tidal forces still operate, with the particular object of ascertaining the fresh water discharge and annual variation.

A compilation of all the available hydrographic information as to the watershed as a whole.

The restrictions as to time, expenditure and available personnel should also be considered when judging the results of this investigation. Every effort has been made to so efficiently deal with each branch of the subject that the information obtained should be as accurate as was possible under the given limitations, but, of course, there are many matters which could and should have been more thoroughly and completely dealt with had the circumstance permitted.

Mr. E. C. Stocker, engineering assistant, has been in entire charge of the hydrometric observations, 1914-1916. He has been assisted at different times by Mr. A. C. Akehurst, Mr. J. R. Harder, assistant surveyor (who left for active service in January, 1916), and Mr. R. S. Jorgensen, works overseer. Others who aided are Mr. E. W. Jonson, Mr. H. Chatley, Mr. H. B. Sanford, Messrs. P. T. Tong, Z. T. King and V. S. Chen; Mr. C. T. Chen; Mr. C. S. Keh.

The officers of the Customs Marine Department engaged on surveying work were Mr. T. H. Bülow-Ravens, Surveyor, who was in general charge, Captains B. H. Gowing, and R. O. Rutherford, and their officers, Messrs. Fraser, Carey, Eliassen, Sjostedt, Terry and Toll. Messrs. H. C. Muller and S. V. Mills also gave valuable assistance. Mr. Y. Utne, Surveyor, and Mr.

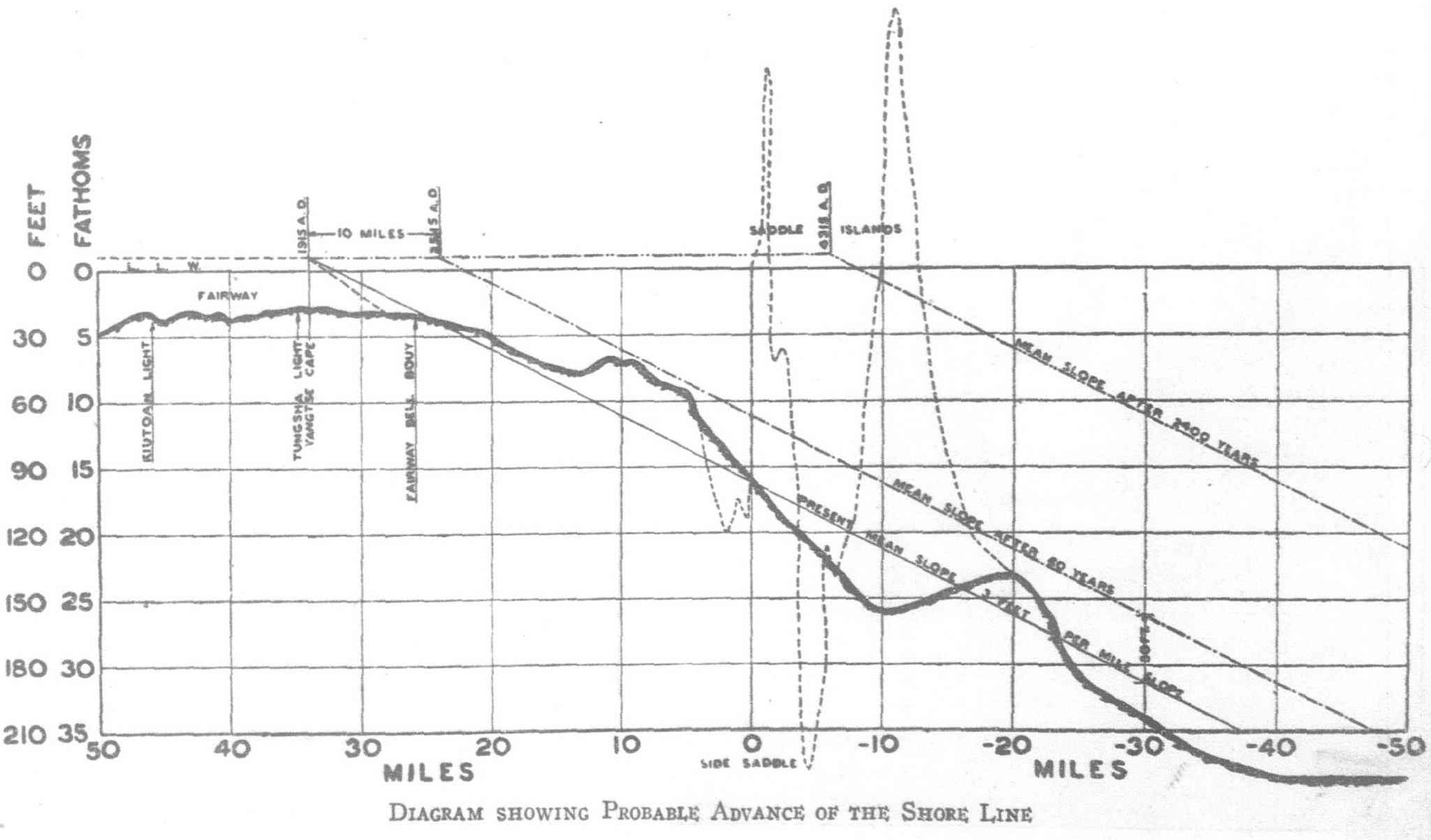
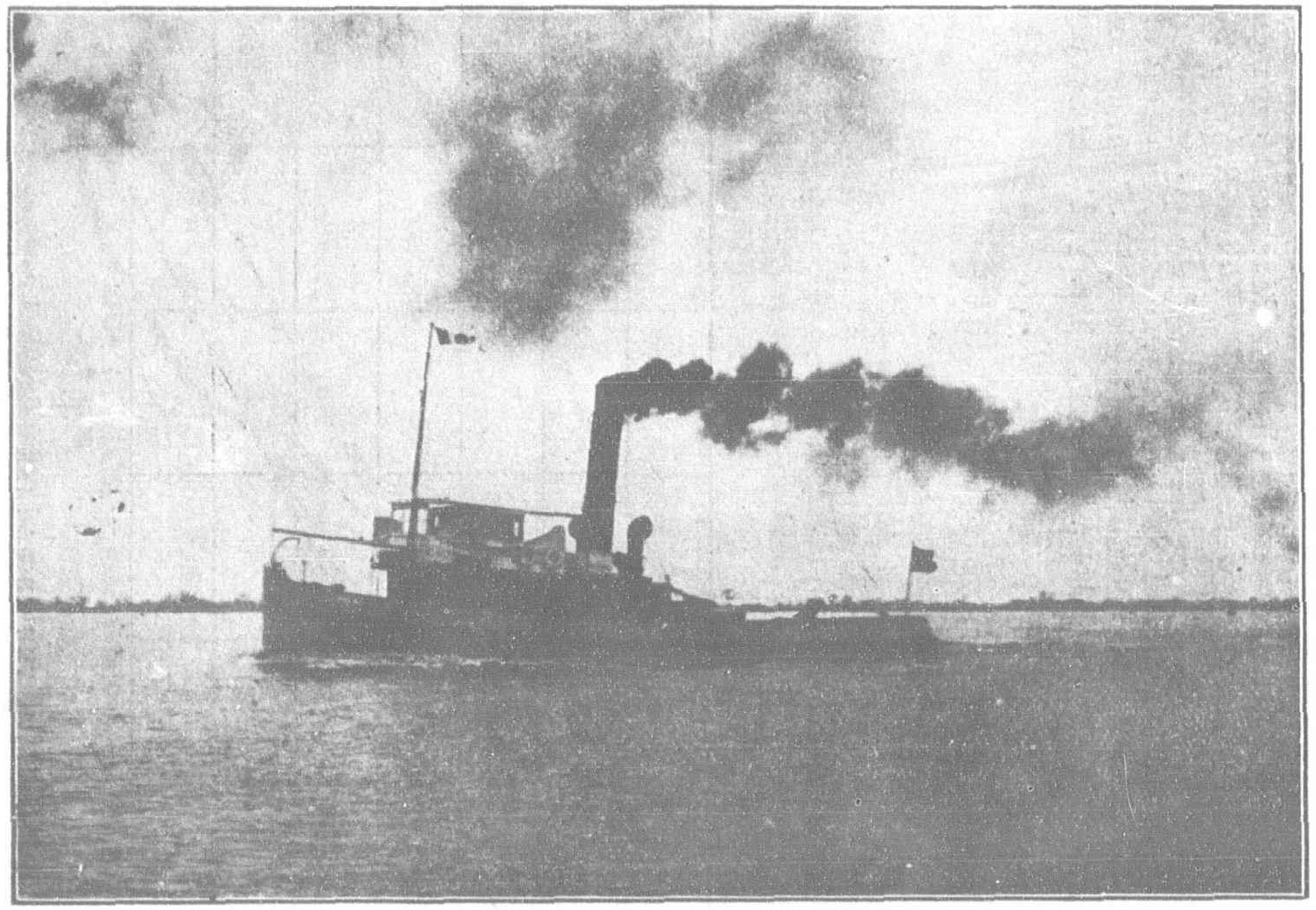
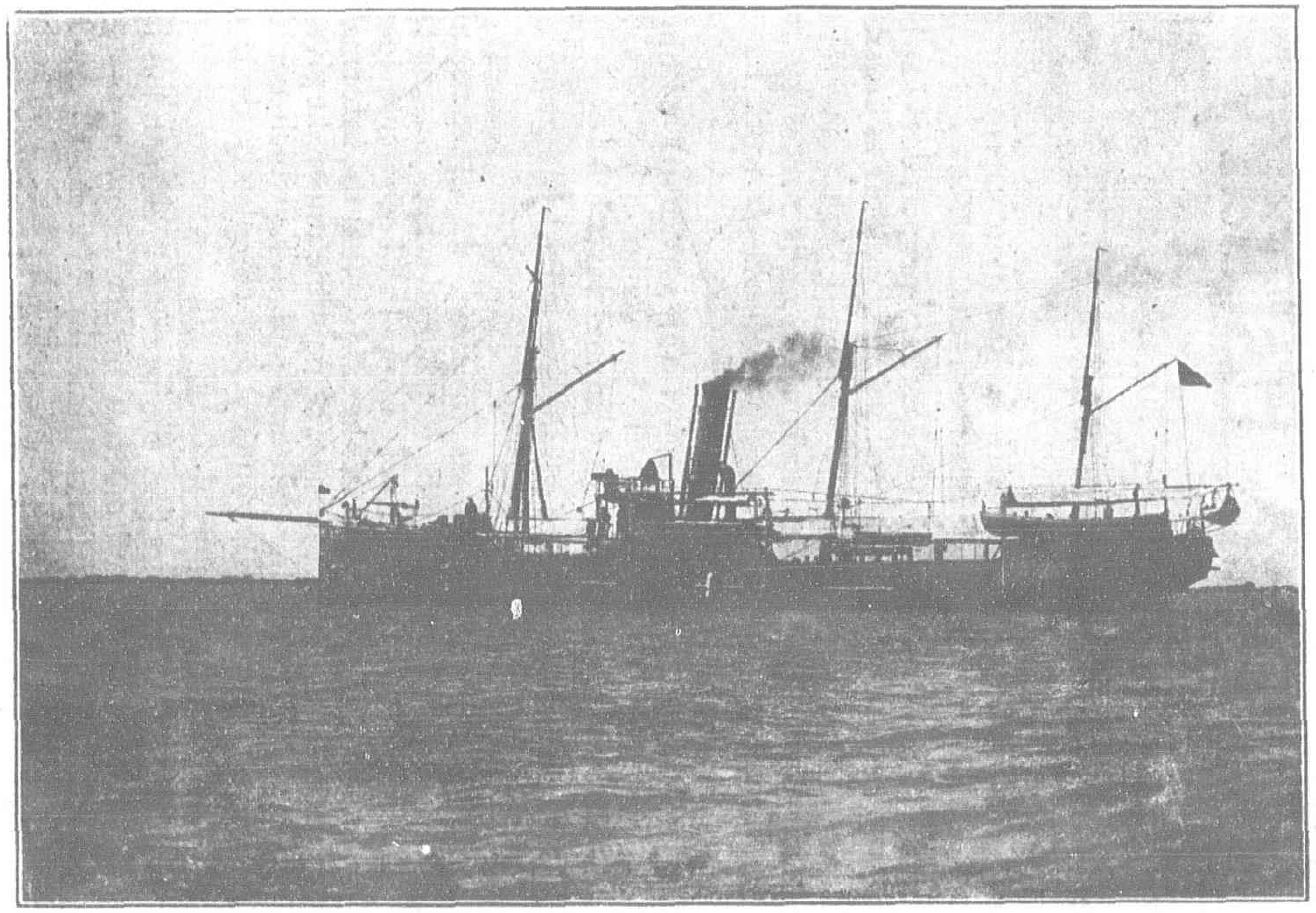


Diagram showing Probable Advance of the Shore Line

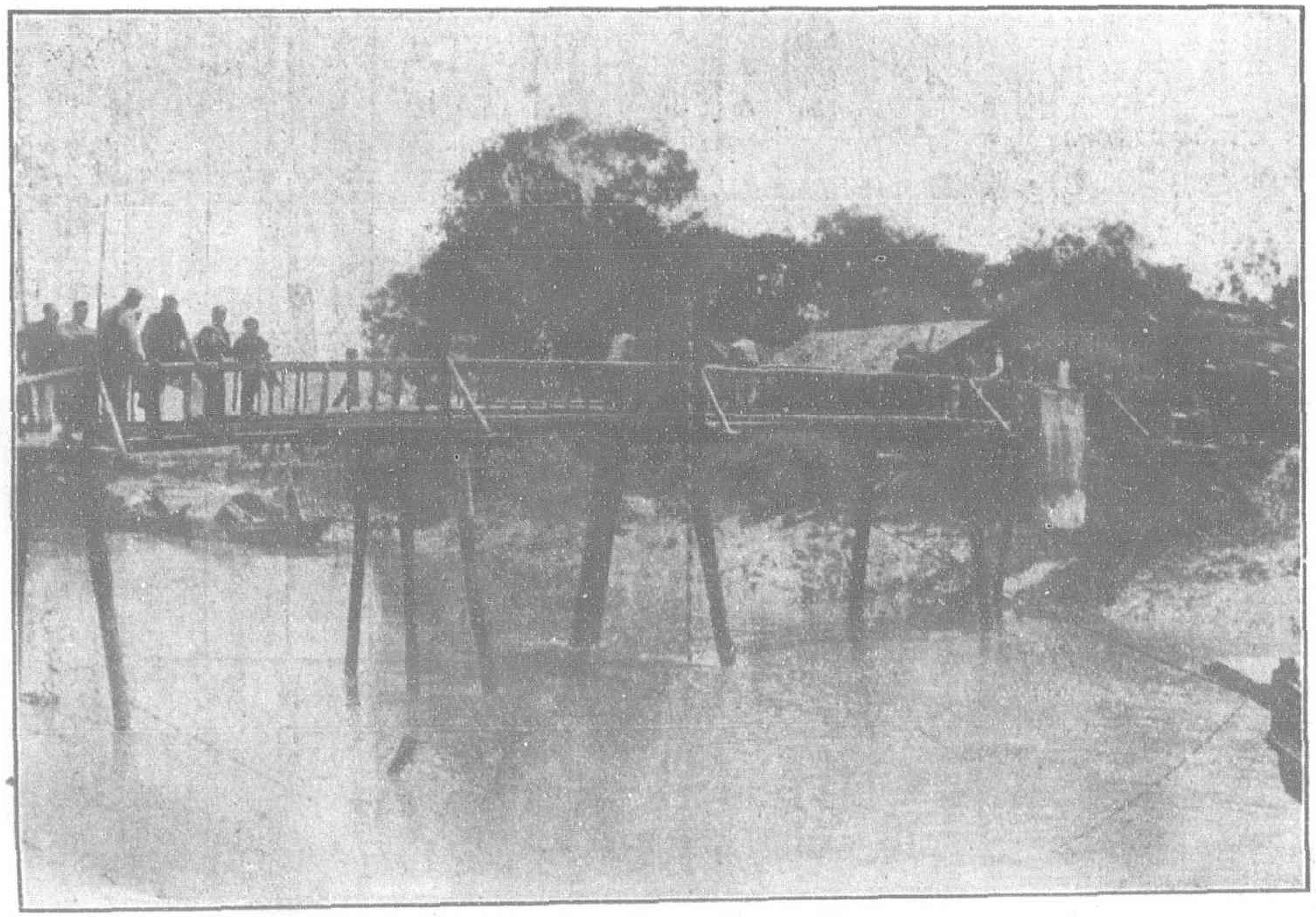
Some Units of the Marine Equipment Used in the Yangtze Estuary Survey



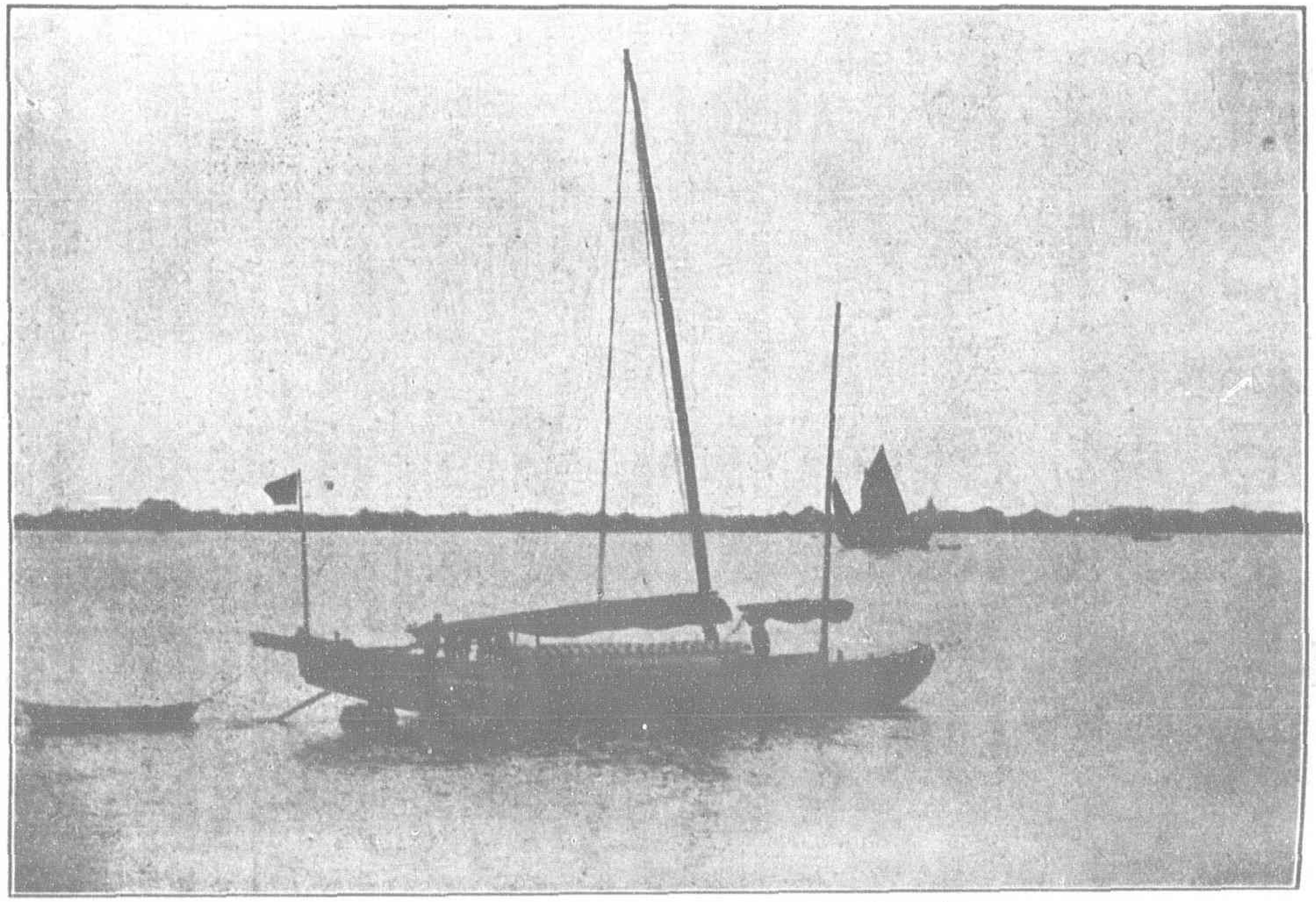
THE CONSERVANCY'S TUG "LI HUA"



CUSTOMS REVENUE CRUISER "LIKIN"



TIDE POLE, POTS TREE, NORTH BRANCH



TYPE OF CHINESE CRAFT USED IN SURVEY

A. C. Akehurst, in the Board's employment, assisted in the surveying work of the revenue steamers.

Investigation Work Done

There is reason to believe that a quantity of valuable information about the early history of the Yangtze Delta lies in present inaccessible Chinese documents. Some Chinese publications have been delved into with some success, but much more remains to be done in this direction.

Positive information as to conditions dates back no earlier than 1842 when the first British Naval sketch survey of the delta was made. The Marine Department of the Customs commenced survey operations in the delta in 1888. In 1901 a complete triangulation from Langshan to the sea existed. In 1913 this was extended to Pitman King Channel. Subsequent to 1901 there is a fairly continuous record of main changes below Langshan.

At the date of the commencement of our investigation the Customs Marine Department had accurate surveys from Pitman King to the sea, including the North Branch as far seaward as the eastern end of Tsungming Island. In addition to these surveys, new surveys were made for joint purposes.

In view of the rough character of the detailing in the older surveys no very great reliance can be placed on the apparent changes.

On the other hand it is evident from these charts that no great changes have occurred in the general regimen, and that at certain points progressive changes have occurred.

Throughout the whole of the levelling operations the Woosung Horizontal Zero has been adopted as a universal datum. This level is the lowest low water mark observed during the last decades, and is recorded by a base bench mark consisting of a monolith at the Customs Harbour Master's Station at Woosung.

Universal Level Datum for China

As the Woosung Horizontal Zero has been adopted as the universal datum for the observations, I would suggest that it is suitable for more extensive use as a general datum for China in general or at least for the whole of the Yangtze Valley. The mean sea level of the China Sea (i.e., the imaginary level of the surface of the ocean in the absence of tides, currents and wind) is the natural plane of comparison, but Woosung Horizontal Zero happens to be a close approximation to this and it is hoped that in the near future its relation to the mean sea level will be determined with great accuracy.

The Woosung Horizontal Zero has been found eminently satisfactory as a datum for the conservancy of the Whangpoo, as a datum for municipal and building work in Shanghai and as a standard of reference for the water levels in the Yangtze and could easily be connected with the present datum levels of the various trunk railways of China. It has already been related to a very large number of bench marks, and differing as it does but slightly from mean sea level, in using it as a standard of reference, negative values can but rarely occur.

Establishment of Tide Reading Stations

In October, 1914, when the investigation was commenced, continuous tidal observations were already available for several years at Woosung Forts and at the Customs stations at Chinkiang, Nanking and Wuhu. Records from these stations were insufficient for the purposes of the study of the nature and propagation of the tidal wave in the estuary, and the following principal tide reading stations were established and read together with those already established by the Customs, as follows:—

Side Saddle Island, to indicate the oceanic tide from which all the others in the estuary originate.

Woosung Leo Point, Plover Point and Tungchow, at critical points in the estuary where they would serve in connection with the discharge measurements and also indicate the propagation of the tidal waves; Pots Tree, at the upper end of the North Branch; Kiangyin, at the head of the Estuary; and at Chinkiang, Nanking and Wuhu.

Supplementary tide reading stations were established at different times during the investigation at Gutzlaff and Shaweishan to indicate the progress of the tidal wave in the mouth of the estuary; Liu Beacon in the North Channel; to make comparison with the tidal propagation in the South Channel as observed at Woosung Forts.

Tungsha, Nanhui Beacon, Kiutoan Small Beacon and Kiutoan High Beacon, to indicate the progress of the wave in the estuary, below Woosung, and Da Kong, at the mouth of the North Branch. Observations were taken at the stations over varying periods but long enough in each instance to obtain the relation of the tide at each place to that at the more permanent gauging stations.

Permanent Automatic Tide Gauges

As the investigation proceeded the necessity of continuous observations at the Side Saddle Island and at Kiangyin became apparent, and led to the establishment, in conjunction with the Marine Department of Customs, of permanent observation stations with automatic recording gauges.

The principal constructional features of the Side Saddle installation are a breakwater, partly closing the entrance, built with a foundation of rubble stone: the well, a cast iron hollow watertight cylinder 3 feet 6 inches diameter by 25 feet long, weighing five tons, is further ballasted with one ton of concrete and is held in place by two sets of I beams running across and embedded in the piers on either side; the house is built of cement concrete reinforced with triangular mesh reinforcement. The cost of the installation was borne by the Marine Department of the Customs. The automatic tide gauge at this station is one providing for a continuous record. It is supplemented—in order to guard against stoppages, which have occurred—by a gauge of the board's standard pattern, having a daily record. The installation has been turned over to the Customs and two Lightkeepers have been stationed there to look after the gauge. To guard against an irregularity in the working of the instrument they read the tidepole every 10 minutes.

General Analysis

Various observations having been taken at numerous related points in the estuary and diagrams and records having been duly prepared, the next step is to analyse and compare the records. The investigation naturally falls into parts:—

The study of the manner in which the tide originates and of the tidal curve at each station; and the study of the propagation of the tide through the estuary and its modification by the gradient and fresh water discharge.

To deal with the series of curves of the estuary it is desirable to select the tide at one particular place as fundamental. It has been found desirable in this investigation to regard the Woosung tide as a standard of reference since it is the lowest station within the estuary at which an automatic tide gauge can be conveniently established; it is directly accessible and can be directly referred to the datum; it has been observed for many years; it indicates the dominant pulse in the Whangpoo and it is sufficiently near the sea to fairly well indicate the nature of the oceanic tide.

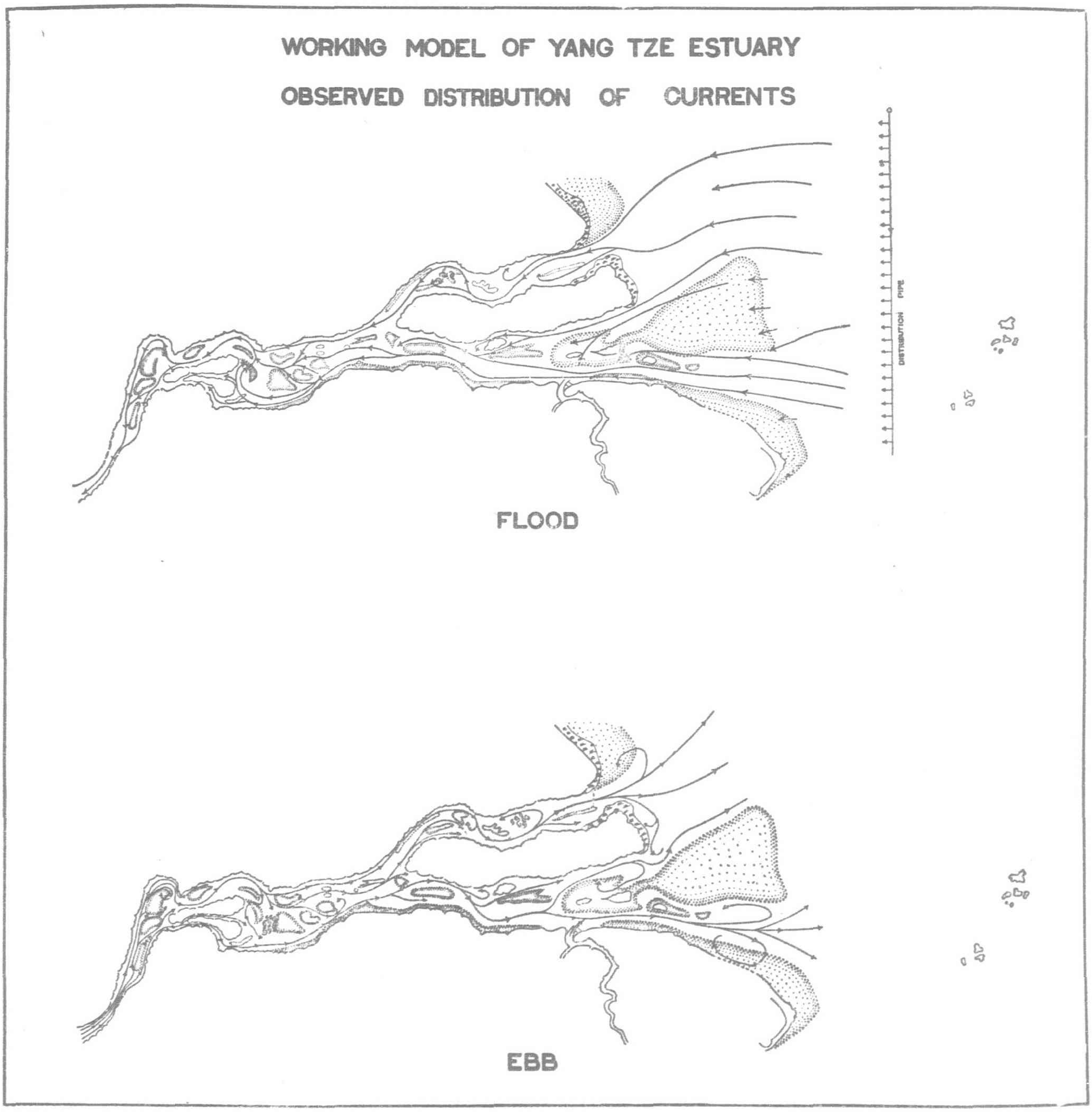
On the other hand, the range is somewhat less than that at the mouth of the estuary and the nature of the tide has already been considerably influenced by the river so that the true oceanic pulse can only be accurately observed at the Saddle Islands.

Aim of Tidal Curve Analysis

The principal means by which tidal forecasts are produced is by "harmonic analysis." The famous French mathematician, Fourier, proved that any periodic change, no matter how intricate, can be resolved into a number of simple harmonic components. In the case of the tides the matter is further simplified by the fact that the periodic times of each and all the components are quite accurately known from astronomical data. A device invented by Lord Kelvin which will perform the operation of combining the various components (some twenty-three in number in the case of the tides, eight of which are very potent) mechanically enables the predictions to be made with great rapidity once the ranges of each component have been determined.

It is hoped that ultimately it may be possible to supply all the data requisite for such an analysis in order to improve upon those already existing, but in the meantime some attempt has been made to investigate the Woosung tide in a simple manner, but on the above-mentioned lines.

Without going fully into the intricacies of the complete harmonic analysis, an endeavour has been made to approach a little closer to that end. The tide at any place is fairly completely specified if the following particulars are known:


WORKING MODEL OF YANG TZE ESTUARY
OBSERVED DISTRIBUTION OF CURRENTS
DISTRIBUTION PIPE
FLOOD
EBB

Distribution of Currents Observed with Model

Mean water level, the age of the tide, the mean or vulgar establishment, the mean spring and neap ranges, not including diurnal inequality, the diurnal inequality of range and the proportionate effect of wind of prescribed intensity and direction upon the water level. The information at our disposal on this point is as yet far too incomplete to warrant any very definite conclusions in the matter.

In addition, it is important to know in the special case of this estuary the effect of fresh discharge which, in the case of the Yangtze, causes an annual rise and fall of 2 feet at Woosung.*

Discharge Measurements

The discharge of the Yangtze has been observed at four places; Wuhu, Kiangyin; Leo Point in South Branch and Mason Point ("Pots Tree") in North Branch, which latter together form one cross-section of the whole estuary.

At the first the tidal influence is small but not negligible, especially at low river. At the second, the tidal influence is very considerable but at high river in summer there is no upstream current. At the third and fourth the tidal influence is enormously preponderant. The station at Wuhu was chosen because it is the nearest convenient place where the actual fresh water discharge can be determined.

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*All these factors are worked out and reduced to diagrams in the report, but the discussion being technical is omitted.

Having deduced from our numerous measurements a fair rating curve for the mean daily discharge, we could apply the records of the mean daily waterlevels and so obtain a discharge curve during the year for all the years where the observations of waterlevel at Wuhu are complete. In the "Yangtze Pilot" a curve is given showing the average water levels for a period of fourteen years, from 1897 to 1910 inclusive. From this and the rating curve the mean discharge during the year is found to be 1,047,500 cubic feet per second.

This result must only be considered as tentative. Greater accuracy would be obtained by considering the daily tide readings, but lack of data and time prevent this from being done at present.

The minimum recorded water level at Wuhu is 0.6 on the tide gauge there, corresponding to about 250,000 cubic feet per second. The maximum recorded water level is 30.8 feet but the bunding is passed at 27.66. The latter corresponds to some 2,700,000 cubic feet per second. In view of the lateral flooding when the dyke level is passed the curve cannot be safely extrapolated to the maximum figure, but analogy suggests that the discharge could not under those circumstances be less than 3,000,000 cubic feet per second.

At Kiangyin and the subsequent stations the discharges were measured through whole tidal periods, as is being done in the Whangpoo. The maximum mean rate of discharge during an ebb current was 2,135,834 cubic feet per second, the mean area being about 560,000 square feet. The highest filament velocity observed was 6.30 feet per second. Thus the average of all the computed non-tidal discharges is 1,250,148 cubic feet per second.

At Mason Point or Pots Tree an inspection of the results shows that on the average only about one-quarter of the non-tidal discharge (ebb minus flood) passes into the North Branch, the rest going through the main South Branch.

Leo Point is in some ways the most important section in regard to the conditions at the mouth of the Whangpoo. Velocities of over 6-ft. per second have been observed, corresponding to an instantaneous flood discharge across the section of some 5,000,000 cu. ft. per second. The ebb discharge during a tidal period is about 2.5 times the flood. The net non-tidal discharge for the whole tidal period averages over one million cub. ft. per second, and is three or more times that through the Mason Point—Pots Tree section.

Silt Determination

River water contains substances in solution and suspension. The matters in solution are usually of the class known as salts, especially the following: Sodium Chloride, Magnesium Chloride, Calcium Carbonate, Magnesium Carbonate, Calcium Sulphate. According to an experiment made with filtered Whangpoo water on the 11th December, 1916, this water has a specific gravity at 4° C. of 1.00016, which means that the soluble content is approximately 0.016 per cent. by weight or 160 parts per million. The water analyses published in the "Municipal Gazette" show from 16 to 17 hundredthousandths (=160 to 170 millionths) of soluble matter. Near the Fairy Flats (5 miles south of Fairway Bell Buoy), the specific gravity is 1.01814, showing the increase of salinity as the sea is approached. According to the observations made by H. M. S. Challenger in 1874-5 the specific gravity of ocean water in the North China Sea is 1.0250.

By making in our laboratory an artificial mixture of Whangpoo mud and Whangpoo water it was found that the strongest (quasi-saturated) mixture which continuous agitation of some 10 feet per second would produce, had a specific gravity of 1.04558 at 18° C. = 1.04704 at 4° C.

By filtering (including condensation of the fine silt by acid treatment or "ionizing" and boiling) it was found in this case that the silt present was 68319 parts per million by weight. A second trial gave 65388 parts per million.

It seems probable, judging from the general geological character of the Yangtze basin, the fineness of the silt, plasticity and analogy with other cases, that the majority of the silt consists of Kaolinite (clay) (specific gravity = 2.60), mixed with a small proportion of other minerals.

Discharge of Silt from the River above Kiangyin

The discharge of water from the Yangtze varies from 250,000 to over 2,000,000 cubic feet per second. An average based on the Customs records of flood levels and the rating curve at Wuhu gives a mean of 1,047,500 or, say, 1,050,000 cubic feet per second. The silt observed at Wuhu varies from 56 to 1,412 parts per million by weight, and an annual average of 500 is probably not far from the truth.

Five hundred parts per million by weight, assuming a specific gravity in bulk of 1.4, corresponds to 350 parts per million by volume. This leads to a result of 350 cubic feet per second of silt for a discharge of 1,000,000 cubic feet per second of water which corresponds to some 11,000,000,000 cubic feet per annum or about one hundred million tons. This quantity would cover an area of forty square miles ten feet deep.

General Characteristics of the Yangtze River

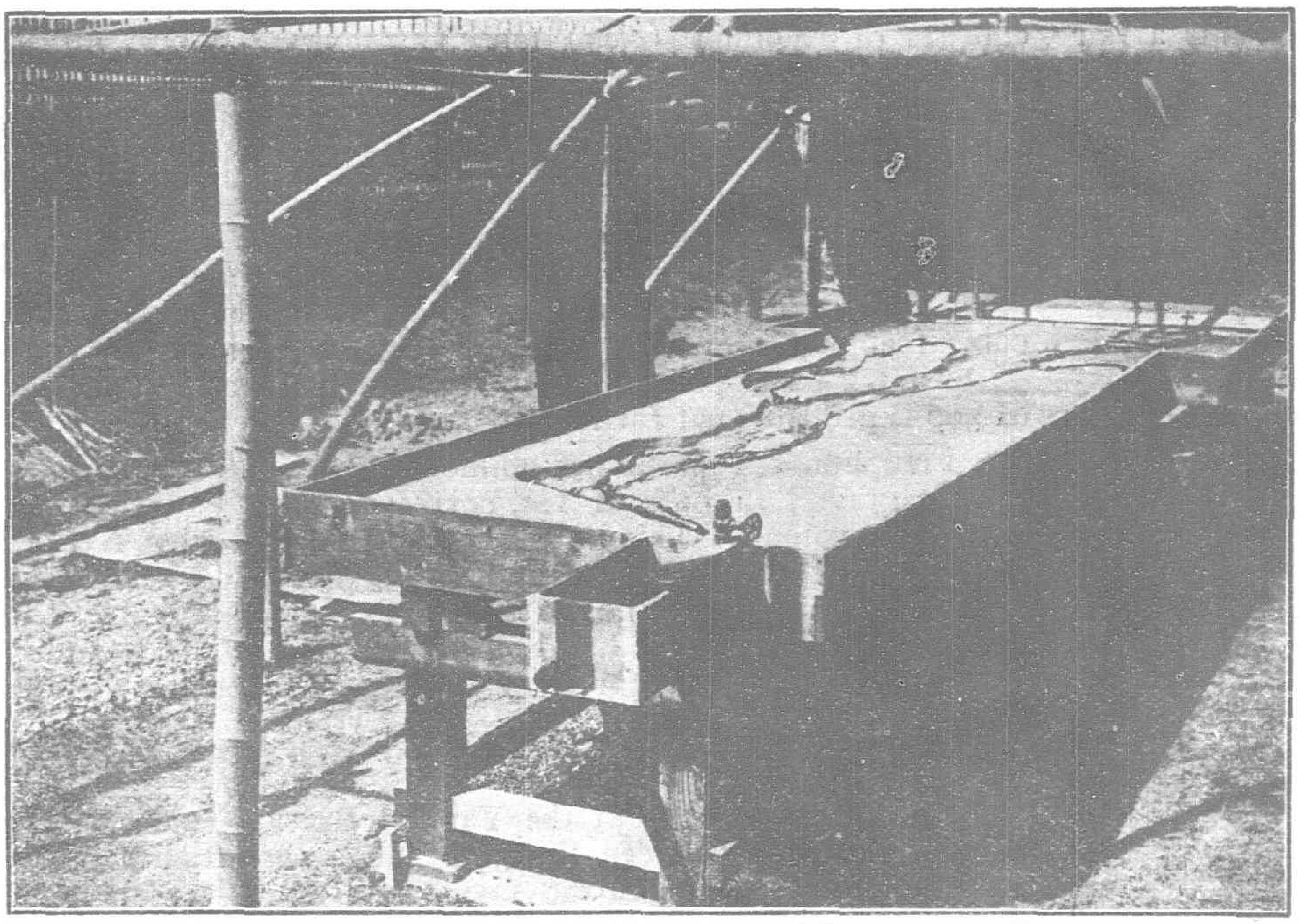
The drainage basin of the Yangtze River occupies a large part of the area between the 36th and 25th parallels North latitude and the 91st and the 122nd meridians East longitude. The river rises in Tibet at approximately 34° Latitude and 91° E. Longitude, flows in a general southerly and easterly direction and empties into the Yellow Sea at 32° N. Latitude and 122° E. Longitude. Measured from a map of the drainage basin it has a total length of approximately 3,200 miles, and, with its tributaries, drains an area of approximately 756,500 square miles. It is navigable from the sea a distance of 1,630 miles to a point just above Suifu, in Szechwan Province. Above this point it is unnavigable, except for short stretches, because of the narrow channel and swift currents in the mountain gorges. In this section the elevation of the river changes from approximately 17,000 to 800 feet above sea level.

In the plateau of Tibet the Hwang Ho or Yellow River, which flows through North China, and the Mekong, the Salween and the Brahmaputra, flowing into the Indian Ocean, also have their source. In this region are numerous high peaks covered with perpetual snow. The Yangtze drainage area, totalling approximately 756,500 square miles, is practically surrounded by mountain ranges, which vary in height from 20,000 feet in Tibet to less than 1,000 feet in the provinces near the sea. On the south it is bounded by the table-lands of Yunnan and Kweichow. The average slope of the river for the upper 1,570 miles which are unnavigable is approximately 9.5 feet per mile, and for the lower 1,630 miles which are navigable, approximately 0.5 feet per mile, and for the lowest section 0.03 feet per mile.

The main stream above P'ing Shan has been but little explored. From the most ancient times Chinese geographers have considered the Min river in Szechwan to be the main stream. It is true that navigation can extend higher up the Min than up the Chinsha, but there is no doubt as to the immensely greater discharge from the latter. The ultimate sources of the main stream are apparently in the Tangla mountains north of Lhasa. Prejevalski visited the stream in 1873 about 3,000 miles from its mouth and found the channel 750 feet wide, the water flowing with a rapid current. The whole river bed from bank to bank was upwards of a mile wide and in summer floods was entirely covered to the banks. Rockhill has also visited it near the Tibetan border. Apparently this part of the watershed is not subject to such a high precipitation as the more southern parts, so that the annual floods of the lower Yangtze are due as much to Szechwan and Yunnan rain as to the melting of the Tibetan snows. This is important in relation to the steep descent from Tibet.

Extent of Yangtze Valley

The northern watershed summit line is considerably higher than the southern one and is regarded by geologists as a prolongation of the main mountain axis of the Asiatic continent ('Tien Shan and K'un Lun). Starting in the Tangla mountains with an elevation of nearly 20,000 feet it falls gradually through



Relief Map of Yangtze Estuary Used in Studying Currents

southern Kansu, where with one exception the most eastern passes still soar to over 5,000 feet, and proceeds onwards through Southern Shensi and Central Honan. It then descends rapidly between the Yellow River (which it very closely approaches) and the Huai, practically dying away into the coastal plain. The water-parting in this region is somewhat indeterminate owing to the artificial works connected with the Grand Canal, but it may be considered to run to near the mouth of the Yangtze.

The southern watershed summit is much more sharply defined. Starting from the Tangla mountains it runs as a razor backed ridge some 3 miles high between the Chin Sha and the Mekong of Lang Ts'iang river until northern Yunnan is reached. For a few hundred miles it then runs very near to the main valley, sweeps away in an irregular curve through Yunnan and Kweichow and turns round the West River basin (which discharges at Canton), still maintaining a general height of upwards of 2 miles. There is one low pass leading into Kwangsi. This southern ridge is known to Western geographers as the Nan Ling but structurally consists of the highest points of a large number of parallel ranges running S. W. to N. E.

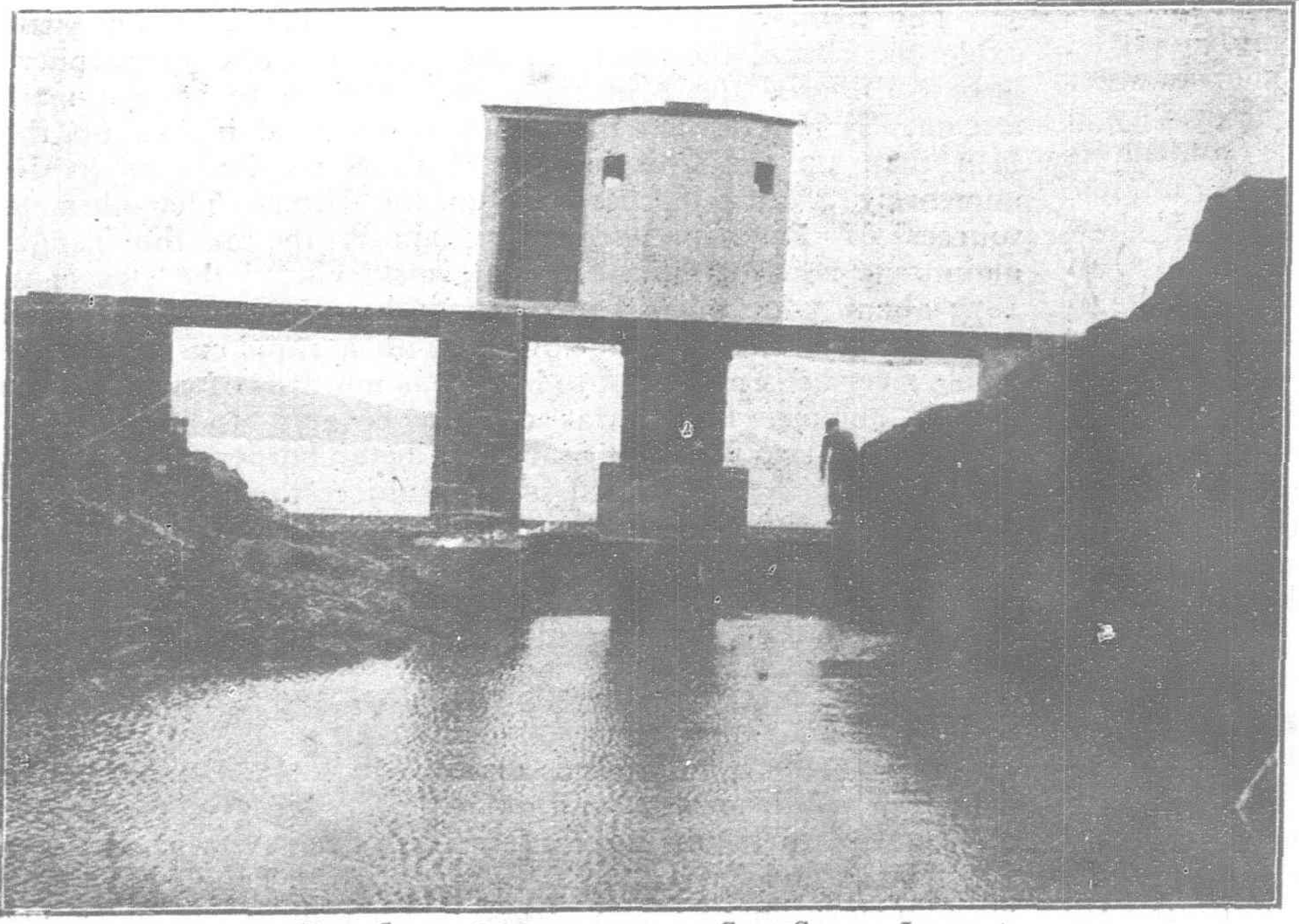
Leaving Kweichow province it forms the southern boundary of Hunan and Kiangsi, the passes *still being* from one-half to one mile high. There is one low pass with water passage into the Kwangtung province. It now enters Anhui, culminating in the Huang Shan mass near Ta T'ung, and swings away towards Hangchow. There are no passes less than 1,000 feet high. The mountains near Mokanshan form part of this tremendous wall which terminates abruptly between Hangchow and the Tai Hu, the water parting terminating in the sea wall near Ka Hsing.

The total perimeter of the basin is more than 8,000 miles or about one-third the circuit of the earth. The area contained is three-quarters of a million square miles and the average height of the whole area is not less than half a mile above sea level. Considered as a whole it is sparsely populated. The alluvial plains below Shashih and the elevated plain of Chengtu in Szechwan are, of course, densely inhabited but these are only a small fraction of the whole area.

Tide Gauge Installation at Kiangyin

From the elevations of various points along the main valley profiles have been drawn showing by a single line the general form of the channel from Tibet to the sea and one showing the lower half to 20 times the vertical scale of the previous one and indicating roughly the bottom, high and low water lines.

The rainfalls based on the observations received at Siccawei from numerous stations are equivalent to a mean rainfall over the whole watershed of 42.80 inches per annum. The Wuhu discharge figures indicate a mean discharge of rather over 1,050,000 cubic feet per second with a maximum value of



Tide Gauge Installation at Side Saddle Island

Precipitation in Yangtze Basin

Name.	Watershed.	Mean of Rainfall inches per annum (from available records).
The Upper Yangtze District, above Suifu	185,318	say 25
Fu Kiang or Min River and the Lu Hu District	51,410	
The Yunnan, Szechwan, Kweichow District, south of the Yangtze, between Suifu and Chungking	26,902	38.81
The Kialing Ho District	63,219	
The Kungtan Kiang District	33,150	
The Middle Yangtze District, from Chungking to Hankow and the Tung Ting Lake District	32,962	50.99
The Han River District	67,859	
The Tung Ting Lake District	97,412	
The Poyang Lake District	69,993	79.19
The Hwai River District	67,357	30.32
The Whangpoo River District	7,731	45.19
The Middle Yangtze District (small tributaries)	31,613	61.99
The Lower Yangtze District (small tributaries)	21,574	45.99
	756,500	

2,700,000 and minimum of 200,000. The area above Wuhu is about 87 per cent. of the watershed and although considerable doubt attaches to the proportion of "run-off" from the lower 13 per cent., we may fairly assume that the effective area which contributes the discharge at Wuhu is 658,000 square geographical miles.

The run-off per square geographical mile thus varies from 0.30 cubic feet per second to 4.10 and has a mean value of 1.60. An inch of rain corresponds to 3,082,000 cubic feet per square geographical mile so that on 658,000 square miles one inch of rain corresponds to 2,028,000,000,000 cubic feet. Since there are 31,540,000 seconds in a year, one inch of rain per annum on 658,000 square miles equals a mean precipitation of 64,310 cubic feet per second, and 42.80 inches corresponds to 2,752,000 cubic feet per second. The ratio of the actual mean discharge (1,050,000) to this is 0.3815 or 38 per cent. The run-off precipitation ratio has been deduced to be 25 per cent. when dealing with the Whangpoo but there is much greater evaporation and very much less slope on the Whangpoo watershed.

The following table shows how the Yangtze compares with other large rivers:—

Great Rivers of the World

	Approximate length (miles.)	Approximate watershed (sq. miles.)	Maximum recorded discharge (cu. ft./sec).
Ganges	1,500	470,000	2,050,000
Volga	2,000	563,000	1,426,000
Zambesi	1,600	850,000	—
Yenesei	3,700	880,000	—
Lena	2,000	940,000	—
Mississippi	4,200	1,244,000	1,617,000
Obi	3,200	1,300,000	—
Congo	2,000	1,350,000	—
Nile	4,000	1,500.000	465,000
Parana, o La Plata	1,500	1,600,000	1,100,000
Amazon	4,000	2,250,000	—
Yangtze	3,200	750,000	2,152,581

A consideration of the question of the proportions of the catchment area served by the river at various places leaves little doubt that the majority of the silt which reaches the estuary can be regarded as originating above Ichang, since while some of the lower streams do undoubtedly feed silt into the Yangtze there is considerable compensation effected in the deposits left in the lake areas by the summer floods from the Yangtze.

The most decisive factor is, however, the relation of the velocity of the water to the hardness of the soil.

The silt in the Yellow River is very largely due to a loose loamy material, technically known as loess, which is believed to be wind deposited sand from the Gobi desert. Some deposits of loess do exist in the Yangtze Basin near Wuhu and also near Suifu, but they are not extensive enough now to play much part in providing silt. Apparently the most important silt producing area is one of about 100,000 square miles in Eastern Szechwan, known as the "Red Basin." The following quotation from one of Richthofen's letters is descriptive of this area:

> Eastern Szechwan may be described as a large triangular shaped basin surrounded by mountains, some of which rise above the snow line and all of which are difficult to cross. They are made up, in the main, of very ancient formations, mostly of Silurian and Devonian age. The basin is filled with sediments of subsequent origin. Among those of them which take part in the formation of the surface, two only are of practical interest, viz., a coal formation of little thickness, and an accumulation of red clayey sandstones, and sandy clays of enormous stratigraphical development. As these rocks predominate largely, and impart their characteristic brick red colour to the surface where it is exposed, the term of "Red Basin" may not inappropriately be applied to almost the whole area of Eastern Szechwan. The summit lines within the basin are nearly at a level with each other and would, if connected, represent an undulating plane elevated throughout its greater position, from 3,000 to 4,000 feet above the level of the sea. But owing to the fact that the beds of the Yangtze and its navigable effluents, by which the province is drained, are situated at 1,500 to 2,500 feet below the level of the plane, and that most of the rocks composing the Red Basin are soft and easily destructible, the rivers with all their widespread tributaries, down to the smallest brooks, have eroded deep channels and converted the entire basin into a thoroughly hilly country. Besides the plain of Chêngtufu, Szechwan does not contain more than narrow patches of level ground, and these are scarce and far between.

The characteristic red colour of the Yangtze when in full flood may confidently be attributed to the large proportion of Szechwan silt which it contains. Some of the soft strata (shales, sandstones and other ancient alluvial deposits) which occur on the flanks of the Nan Shan (the Western geographers "Nan Ling," the southern water parting) and the spurs of the similarly so-called "Pei Ling" are in course of rapid erosion by the eastern tributaries of the Yangtze, but a very large proportion of this silt is deposited in the lake areas which are generally found near the junctions of these streams with the Yangtze. The practice of dyking the banks which exists throughout the level parts of the watershed helps to transfer a proportion of the silt to the main stream, but the efflux from some of these streams is at times comparatively clear. The back pressure from the Yangtze during times of high flood has the double effect of sending some of the silt from higher streams into the mouths of the lower ones and also by checking the velocity of efflux from the lower ones causes them to deposit much of this silt.

As has been shown by Baron F. von Richthofen, over almost the whole of the lower half of the basin, the stratification has a general S. W. and N. E. trend which is reproduced in the ranges from near the junction of the Ya Lung and Chin Sha to the coast. Through these the Yangtze runs in fairly straight, quiet reaches N. E. to N. along the "strike" (i.e., parallel with the out-cropping strata), or in tortuous gorges and rapids E. to S.E. along the "dip" (i.e., perpendicular to the strata).

In the alluvial plain below Ichang this tendency to run either along or perpendicular to the strata still appears but is nullified or masked in many places by the formation of loops and subsequent cut-offs in the alluvium.

The upper part of the river is principally remarkable for the fact that no less than six great watersheds converge towards the same focus, viz. (West to East), the Tsanpu or Brahmaputra, the Irrawadi, the Salween, the Mekong, the Yangtze and the Huang Ho or Yellow River. The Yangtze is the greatest of these but all are important. For about 500 miles the Irrawadi, Salween, Mekong and Yangtze are almost parallel and only about 40 miles apart, the ridges between being, however, more than a mile higher than the river beds. The valleys are clefts in the surface several thousand feet deep and in many places the rivers are almost, if not quite, inaccessible and are exceedingly unhealthy.

Owing to the high relief of the country there cannot have been any appreciable change in the general position of the Yangtze above Wuhu, since the last great earth movement which has determined the present position of the strata. The upper valleys have been deepened and the contents steadily transferred to the lower lake areas and the estuary. This process is continuing and should eventually lead to a condition in which almost the whole of the fine silt will be discharged into the sea, thus accelerating the seaward advance of the coast line.

General Description of the Estuary

At Chinkiang the Yangtze emerges from the hilly area which so far strictly defines its course, but for reasons already given in Section 2, Kiangyin has been assumed as the head of the estuary. During the later millenia this is also topographically correct as far as the right bank is concerned since there is a scattered collection of hills extending from the main mass near I-hsing Hsien round the west and north sides of the Tai-hu past Changchoufu to Kiangyin, but the left bank is less sharply defined.

Counting from Kiangyin the actual estuary area extends 83 miles south-east to the eastern extremity of Tsungming Island. (Drinkwater Point). Details of the water channels are given elsewhere, and it is here sufficient to say that the width between low water lines increases from about 1½ miles at Kiangyin to about 40 miles between the terminal promontory on the left bank ("North Branch Cape") and Yangtze Cape.

Some doubt arises as to the exact limits of the delta but it may be said that the alluvial area below Kiangyin which surrounds the estuary consists principally of two triangular areas projecting into the Yellow Sea, and a large island (Tsungming) between them.

The northern triangle extends from Ju-kao-hsien to the North Cape and is 80 miles by 35 miles wide at root (area: 1,400 square miles).

The southern triangle is defined by the water line and a line from Kiangyin through Suchow and Ka-hsing, terminating at Haiyen-hsien. The base of this triangle is 90 miles long and its perpendicular height to Yangtze Cape is 50 miles (area: 2,250 square miles).

Tsungming Island is 35 miles long with an average breadth of about 6 miles (area: 210 square miles).

Shoals, less than 5 fathoms, extend from the mouths of the estuary fanwise to the line Shaweishan-Amherst-Ariadne and Gutzlaff.

On the left bank above Kiangyin there is a very extensive alluvial area between Yangchowfu (opposite Chinkiang) and Ching-kiang-hsien (opposite Kiangyin), extending northwards to the intricate mesh of lakes and waterways east of the Grand Canal associated with the Huai River. It should be observed in this connection that there are shoals all along the coast north of the Yangtze which are derived either from the Yellow River (in its old position) or the Yangtze, probably the former.

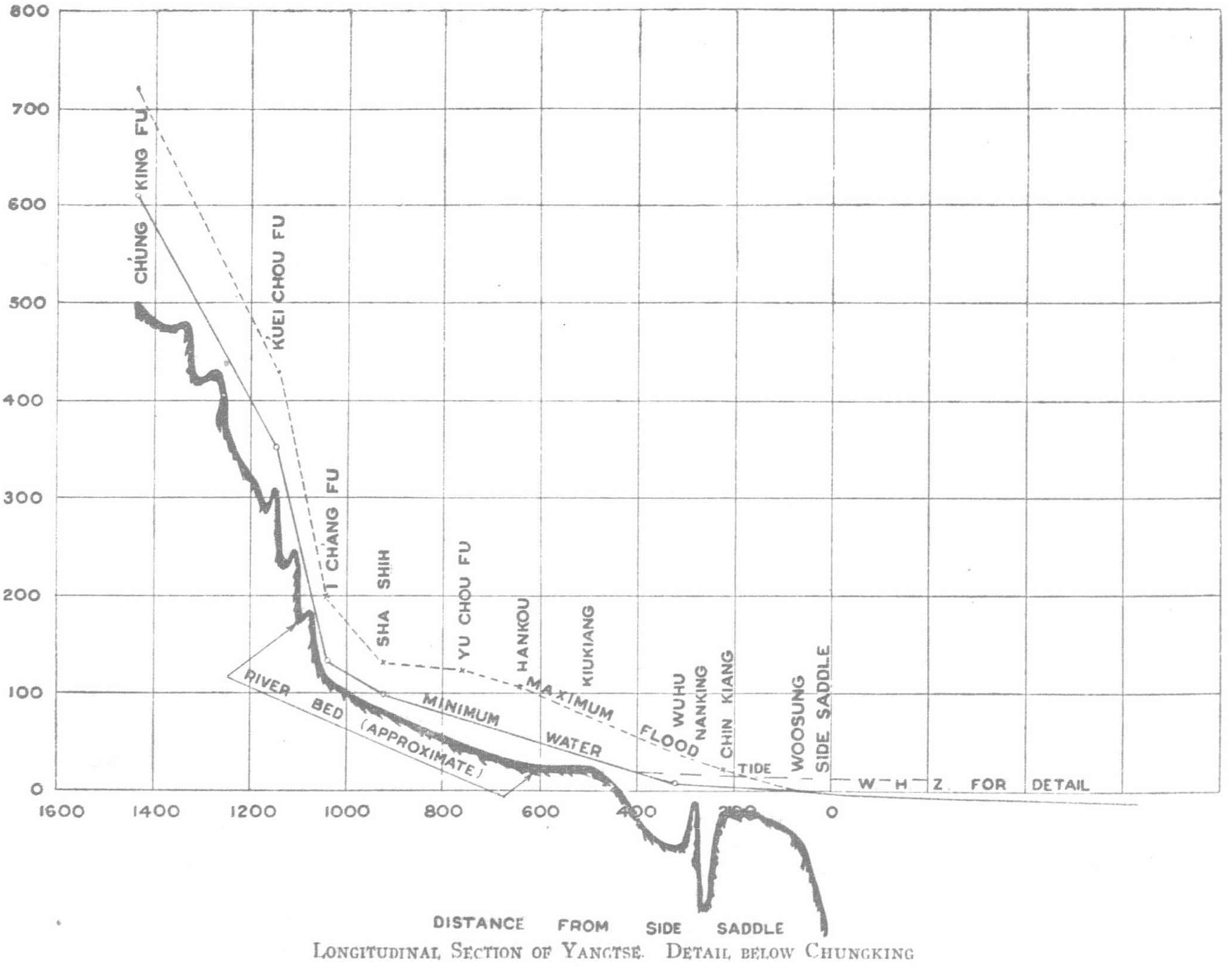
There is an alluvial area in the triangle Huchoufu-Kashingfu-Hangchow, which appears to belong to the Chientang River but may partially or even largely owe its origin to the Yangtze, especially if the latter formerly discharged through the Liyang Gap into the Tai-hu. The northern boundary is similarly ill defined, as the delta merges into the ancient deltas of the Huai and Yellow Rivers.

The general form is comparatively simple and presents fewer irregularities than is the case with most large tidal rivers. Its most striking feature is its immense size. The country in general is extremely flat, the average level being from 12 to 15 feet above the Woosung Horizontal Zero, and it is protected from inundation by dykes.

Age of the Estuary

With a view to future prospects, the age of the estuary is a most interesting subject. In Section 3 it has been pointed out that the annual average discharge of silt is sufficient to approximately cover an area of 40 square miles, 10 feet deep, or 400 square miles, 1 foot deep. This fact may be considered in two ways:—

As to its effect in lowering the denuded areas;



Longitudinal Section of Yangtse. Detail below Chungking

As to its effect in building the plains and so extending the delta.

As to the first if we suppose that two-thirds of the whole watershed (=500,000 square geographical miles) consists of hillsides and other erodible area, this annual erosion corresponds to a reduction in height of one foot in 1,250 years, or of one mile of height in seven million years. It must, however, be remembered that the silt which passes Wuhu (upon which this estimate is based) is only the residue which is left from the total erosion after that which is deposited in the upper areas has been deducted It would certainly seem reasonable to suppose that the actual denudation is at least twice that which is indicated by the Wuhu silt content, i.e., that at least half the matter eroded is left above Wuhu. Furthermore the rate of erosion would certainly be greater in the early geological stages.

As previously mentioned the average height of the watershed is upwards of half a mile and the sources are about three miles high. Geologists are agreed as to the recent character of the Himalayan uplift which formed the southern boundary of the Tibetan plateau, and it seems probable that the Yangtze watershed at the time of that last great earth movement had an average height of not more than a mile and a half. Hence the interval since that time is probably less than seven million years. Such figures are, of course, mere indications.

Secondly, as deposition in the sea continues, shoals are created which eventually raise themselves to the high water level, forming coastal plains. Dynamic considerations lead one to suppose that silt will remain in suspension only so long as there are appreciable currents with a steady trend. In the Yangtze estuary the silt content of the water is very small outside the five fathom line and a rough idea of the rate at which the delta is built up can be gathered by considering the areas within that line.

At the present time the coastal underwater area within which permanent deposition occurs, if it is limited to the five fathom line in the sea, is upwards of 2,000 square miles (its inner limit being a transverse line through the Flats), so that it would on these assumptions rise 1 foot in five years. The bars and other places where there are currents will not, of course, rise at anything like this rate, but this deficiency will be made good elsewhere. A rapid rise like this should show in the course of some 30 years or so quite perceptibly. In this connection it should be observed that Tsungming Island, which now has a population of a million souls, has appeared since 600 A.D. and the "Hsien" city was only founded in the year 705 A.D. It thus provides a very striking illustration of our hypothesis.

The alluvial area below Kiangyin the origin of which can definitely be attributed to the operations of the Yangtze since the time when it debouched at Kiangyin, is some 3,000 square miles. This area could be built up from the sea bottom (about 30 or 40 fathoms, say 250 feet, outside the present shoals) in 1,800 years if the whole deposit were concentrated on it. As a matter of fact the deposition does not occur in such a definite way over a prescribed area but proceeds with an ever diminishing rate over a very extensive slope radiating away from the debouchure. It is shown below that the present rate of progress is about one mile in sixty years, and seeing that Kiangyin is about eighty miles from the present coast line it would appear that a period of upwards of five thousand years has elapsed since the coast line was at Kiangyin. The general level of the country is that of high water, thus clearly indicating its origin. The construction of dykes, of course, accelerates the seaward progress since the areas reclaimed are not necessarily at their full possible height and also the more definite channel maintains the velocities required to carry the silt out to sea.

There is a succession of reclamation sea dykes at Yangtze Cape, which show how rapidly the shore line has advanced.

It seems thus certain that the southern part of the delta has been cultivated for not much less than 4,000 years. Probably definite reclamation by dykes commenced about 2,000 B.C. The northern part is less developed and much of it may have appeared during this period. According to Chinese records the area below Tungchow has undergone a cycle of erosion and re-creation.

Previous to this it seems probable that there was an embouchure of the river through the gap in the Hangchow-Chinkiang range at Kao-chun-hsien and Li-yang, of which traces still remain in the lakes (Shih-ch'iu-hu, Ku-cheng-hu, Chang-tang-hu and the Tai-hu) and during the latter parts of that epoch, Shanghai and Sungkiang were probably on an island with the Whangpoo as one of the arms of the Yangtze. The whole area from below the foot of the hills from Chinkiang to Hangchow (a line roughly coinciding with the 120° E. longitude) amounts to some 15,000 square miles. Borings at Shanghai show boulders and pebbles or marine deposits at about 250 feet deep, so if that depth be considered as the old sea-bed and the present rate of deposition be applied, a period of about 10,000 years is required to build up the whole area. Before that epoch the silt would have been deposited in the numerous depressed areas between Ichang and Chinkiang, where there are now immense quantities of alluvium. A good example of this is seen between Wuhu and Chinkiang where on both sides of the river there is a very broad strip of alluvium extending right up to the foot of the hills and also in the Wuhu-Kaochun-Ningkuofu triangle, which is almost perfectly flat (with shallow lakes) for about 1,000 square miles.

Prophecy is a thankless task but must be attempted. The above figure of 15,000 square miles in 10,000 years (or 1.5 square miles per annum) is, of course, only a reasonable indication of progress, but for the future a more accurate forecast ought to be possible. That the distance from Shanghai to the open sea will steadily increase with time, that islands will emerge and grow on the shoals, that some of these will coalesce by the silting up of passages between them and that the Yangtze Cape and the North Branch Cape will also grow outwards are certain; the only question is, at what rate?

The slope towards the sea of the bottom from the bar to the deep water (250-ft.) outside the islands is about 3 feet per mile, say, 1 in 2,000. The silt deposits on a "front" of over a breadth of $\frac{250}{3} = 83$ miles. The underwater area on which settling occurs may be roughly taken at 8,300 square miles so that it rises nearly 1 foot in 20 years and the average advance of the coast line is 2,000 feet in 20 years or, say, 1 mile in 60 years, but, as the "front" advances, it slowly expands, so diminishing the rate of progress. Shoals would advance more rapidly and bars much less rapidly.

It will, of course, be understood that these figures are only applicable under the given assumptions as to the annual silt and the method of distribution.

Future Possibilities of the Port of Shanghai

Before proceeding to sum up in a condensed form the results of this investigation and the suggestions put forward which arise from those results, I should wish to emphasise that the future welfare of the port of Shanghai is particularly dependent on the conditions of the estuary. Let us first consider the natural and commercial advantages which an ocean harbour of premier rank at the mouth of the Yangtze and on its southern bank may reasonably expect to have in the future:—

It will be situated at the mouth of China's largest river, thus having the whole Yangtze Valley as a hinterland, with say 250,000 square miles productive area and a population of some one hundred and eighty millions constituting about one-half that of the whole of China. Its communications by water (rivers and canals) with this hinterland will be good or capable of development and those by rail have every possibility of expansion. By means of lines at present projected there could be connection with all the important points in the south of the Yangtze Basin. The existing lines serve the lower part of the northern basin, as well as actually tapping valuable territory beyond that limit in Northern China. Ultimately it may be expected that communication will be established viâ Peking direct with Irkutsk and with India and Tibet and a railway is already schemed to facilitate the transport of the immense Szechwan trade.

The delta of the Yangtze is situated at almost the easternmost extremity of China, that is, of the Central Asian seaboard, and therefore lies in the most favourable position for transoceanic connection along all the main lines, i.e., with Japan, Vancouver, San Francisco, Panama Canal and South America, as well as with Hongkong, the Philippines, the Straits, Australia, India and the Suez Canal. Traffic from America to Asia and *vice versa* has a natural tendency to flow towards and from the Yangtze Estuary. The geographical position of Japan also favours such a final position for the steam lines of world traffic. Its situation with regard to all the coast and river ports of North and Central China will be favourable.

Secondly, let us proceed to consider the general lines on which the world's trade and communications are likely to develop in relation to commercial ocean harbours. It appears to me that the main features of such development are as follows:—

An increasing need for greater speed and comfort for passengers, and speed of transit and handling of the cargo carried, and a generally increased efficiency, which will spread from the Atlantic to all oceans and continents within a couple of decades.

A general increase of ship dimensions. To any one conversant with the development in naval architecture, a draught of from 40 to 50 feet is a certainty in the near future, although the average draught will naturally increase at a slower rate.*

A focussing of the principal ocean traffic lines upon first class harbours with proportionately developed mechanical appliances for handling cargo and communications for distributing the same, and a general concentration of the corresponding trade and business at these places. The distribution then takes place by lower draught steamers to second class harbours and by inland communications by land and water.

The difficulty and enormous cost of providing and maintaining such first class harbours in positions with the necessary inland communications, hinterland and trade facilities already in existence, will make it impossible even for large nations to maintain more than a few or perhaps only one such first class harbour.

Everything then points to the increased centralization of large ocean and express traffic with the corresponding trade about certain foci, and it is perfectly obvious that a port as defined above has all the general geographical qualifications for such a focus, provided it were able to offer every possible harbour accommodation and ample means of inland communication by rail and water as well as all other facilities of a tradecentre. Basing a forecast upon the present observable rate of development, it requires very little imagination to come to the conclusion that such a centre could be made a tradeport of the first magnitude.

The question then arises, can Shanghai, which so far has fulfilled its mission as the only estuary port and up to the present has served as one of the main ports in this part of the world, continue to do so in future? The limitations of the present training and dredging works project for the Whangpoo are obvious, however successful it may have been and will be in attaining its object proper, i.e., the creation of a 900 feet wide channel of a least depth of 20 feet at ordinary low water springs. The very best possible result would be a depth of 24 or at the utmost 27 feet at lowest low water over a width of 600 feet. This result alone cannot, say 10 years hence, satisfy the needs of the potential trade and communications of a greater Shanghai.

It appears thus obvious that the needs of Shanghai as a leading ocean trade port will in the future, say only ten years hence, from the technical point of view of navigational depths and widths and harbour accommodation, etc., not be sufficiently served by the present work-project for the Whangpoo Regulation alone; and that, provided the desirability of the future development of the port of Shanghai is assumed, it is essential to come to a conclusion as soon as possible, whether it is possible to make Shanghai a modern ocean harbour, and if so, what the general lines of its development should be.

The factors which will determine this issue are many and partly interdependent. The principal technical ones are the policies adopted as to the development of railway communications *vis-a-vis* Shanghai as compared with neighbouring ports; the harbour facilities (berthing of ships, storing and handling of cargo) which can be offered by Shanghai as compared with those of other ports in the vicinity; the approaches, natural or artificial, to the harbour, through the estuary.

Consequently, the answer to one of the main questions which will decide Shanghai's future lies hidden in the estuary, and thereupon depends to a large extent whether Shanghai shall become really great or fade away to a mere coastal depot for the local distribution of commodities.

Certain conclusions as to the estuarial influence on the conservancy of the Whangpoo and the sea approaches to Shanghai, were more or less anticipated, but can now as a result of the investigation be expressed authoritatively. They are as follows:—

That there is no immediate danger of any change directly affecting the Whangpoo, either by change of the channel at the mouth or by reduction of tidal action.

That the approaches, which have an all important bearing on the question of the future of Shanghai as an ocean harbour, are likely to keep at the same or even less depth. In the best channel, the Fairy Flats are now only 16 feet at lowest low water, and thus all ships over this draught have to wait for higher tide, and if a ship draws over 27 feet there are several days in a month in winter when she may not be able to pass at all. In Summer one to two feet greater depths can be counted on.

That changes are going on which affect the regimen of the estuary, although not in any violent way. There is in several places a steady motion, which if it is not followed may lead to unexpected conditions. Such a crisis, if the question is not studied to some extent, will have very little chance of being adequately met and prevented.

As regards measures to improve the sea approaches to Shanghai this question is entirely dependent on the view adopted as to the general policy of Shanghai's future development as a port and lies outside the scope of this investigation. I have, however, endeavoured to make clear that—on the basis of the present rapid rate of development of trade and communications —a modern commercial ocean port in the estuary has all the natural possibilities for a leading position as such, but that if Shanghai is to play that rôle, her facilities for navigation and harbour accommodation have to be brought in line with those of other ports of the first order within one or two decades. It takes many years to prepare for the execution of large harbour improvements, to weigh the different possible projects against each other, to secure the necessary economic co-operation, and to work out a practicable solution even as regards the technical aspects only of the question. It is further essential that the lines of development are decided on as soon as possible so as to prevent any unnecessary clashing of interests.

The magnitude of the question of development, i.e., whether and how Shanghai can be made a modern ocean harbour, will make it, however, a matter of considerable time to supply an adequate reply thereto. While this general question may be left alone for the present and later considered from different aspects, I now propose to continue the investigation as regards the approaches (which is one of the main technical factors) to a final practical conclusion, if such be possible.

The research, laboratory and office work required for this purpose will then be continued by this Office on the following lines:—Continuation of the research with the model which will take some 12 months and involve hardly any expense; and rough estimates of cost of any scheme or schemes found to be favourably indicated by the model or otherwise worthy of consideration, which also requires little or no extra staff. Upon the possibility of and eventual practical projects for dealing with the approaches, I hope to be able to submit a report at the end of next year.

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*The Panama Canal as planned permits draughts up to 40 feet and the Suez Canal in 1914, allowed ships of 30 feet draught to pass, and is being planned for at least 36 feet.

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CHINESE POLITICS

The internal situation in China is not what could be called encouraging, though optimists hope that it will very soon adjust itself. At the moment the forces of the so-called independent government of Canton are in conflict with the troops of the Peking Government in the southern part of Hunan province, and victories are claimed for the northern troops. What these hostilities actually amount to cannot yet be said. On the one side the Peking Government has virtually outlawed Dr. Sun Yat-sen and his leading associates, and on the other they have given a Roland for the Oliver by ordering the arrest of Premier Tuan Chi-jui. The southern party is fighting against significant odds. They have little if any sympathy from foreign countries, while the Peking Government, being the *de facto* government, has assured support from the Allies engaged against the Central Powers. This is a big advantage, for foreign sympathy counts for much in a country which is not actually independent. Up till very recently the policy of the Central Government was to ignore the element which has centred itself in Canton and there called together the members of the defunct Parliament, but now that General Lu Yung-ting—the virtual commander of whatever effective forces are centred in Kwangtung and Kwangsi provinces—has practically declared himself against the north, it is compulsory for the Peking authorities to readjust their views. The public are allowed to understand that the troops of the north will be dispatched against the South in earnest, though the South are inclined to scoff, owing to the interruption to traffic and other handicaps caused by the extensive and disastrous floods in northern provinces. The hostilities in southern Hunan cannot therefore be decisive, and if both sides persist in their attitude many moons will wane before there is a settlement. Canton demands the recall of the disbanded Parliament and the passing of the Constitution half made by it before the compulsory dissolution, while the Peking Government considers that it has satisfied all needs by calling a National Council and promising a Parliament to be elected under a constitution and regulations which the National Council shall in due course produce. And as neither side will budge from that stand there is only one way out of the trouble. They must fight. Well-wishers hope that wiser councils will prevail and that the country will be spared the disaster of another civil war.

In Szechwan province the forces of Yunnan and Szechwan —which have a local quarrel—have resumed fighting, and generally there is chaos in the province. The Peking Government is extremely annoyed and has issued a mandate (Oct. 17) ordering the Yunnan troops back to their province, pointing out that should this order be disobeyed the Peking Government will be forced "to devise means for the centralization of power and to maintain the peace and order of the country." The Peking Government has a large job on its hands.

Apart from these two open conflicts there is much agitation of the political waters, so much so that it is extremely difficult to make the many political changes in and out of Peking understandable. Doubtless any Western mind trained in the science of European or American politics would find the present situation a most staggering proposition to unravel if the standards that would be employed by a political scientist of the west had to be utilized. In Europe and America the term *government* signifies organization. That is not so in China, and the utter absence of an organized state makes the interpretation of political events peculiarly complicated. "Government" in China connotes control by a collection of individuals who have come into power by virtue of armed force. Highly developed party government does not exist, though if it were possible for one party or faction to gain and hold control for any length of time the situation would naturally become less complex. Owing to the lack of any one large and well-recognized party, however, China finds herself continually resorting to compromise as the only method of solving her internal difficulties, and therein lies the greater part of her trouble. No internal political issue has yet been fought out to a finish, and consequently no large, patriotic party has been evolved. Party politics have, however, come to stay in China, and before Yuan Shi-kai's death those possessed of first hand knowledge of Chinese affairs realised that any political leader who undertook to override both of the great existing political parties—the Chinputang and Kuomingtang—would find himself in a sad plight. When General Tuan Chi-jui created the expeditionary force which ultimately drove Chang Hsun from Peking and restored the Republic, he would have been better satisfied with the result had he been able to eliminate from his calculations both of these political parties. He, however, realized the impossibility of doing so, and having the Kuomingtang arraigned against him, the only alternative was to retain the services of the Chinputang leaders. In the formation of his Cabinet he attempted to satisfy the Chinputang, the Chiaotung party, and the Anhui, Honan, and Shantung military leaders. The result was that as soon as he took up the reins of government he found himself in a very serious predicament, because his Cabinet differed upon nearly all questions, owing to its composition having been effected upon the basis of compromise. The coming of General Feng Kuo-Chang to Peking in succession to General Li Yung-hung as President further complicated General Tuan's task in that the Chihli military faction were under the control of General Feng rather than the Minister of War, General Tuan.

Since resuming the duties of Premier, General Tuan has found his position most difficult. His troubles have been unexpectedly greatly increased by the declaration of war by China upon Germany and Austria mainly because of the lack of administrative organization, and the financial stringency. As soon as war was declared the first thing thought of by the Cabinet was how to get money.

The German and Austrian vessels remaining in Chinese ports were seized by the Government and were chartered to Chinese companies instead of being transferred to the Allies for use in prosecuting the War against the Central Powers. Negotiations were successfully carried on for the suspension of payments in connection with the Boxer Indemnity for a period of years and for the increase of the custom's tariff, and these necessary preliminary steps were construed by critics to indicate that the whole thought of the central authorities was to see that China should profit financially as a result of her entry into the War.

Because of the fact that money would not be forthcoming from internal sources in sufficient quantity for immediate use various members of the Cabinet vied with each other in endeavoring to contract foreign loans. Great Britain, France, and the United States being preoccupied with the War did not have the interest that they would have otherwise manifested in the matter. Japan being the only one with a free hand naturally took advantage of the opportunity offered, and Japanese financiers set to work to form alliances with those who would be in a position to assist them. The Yokohama Specie Bank provided a ten million yen loan for the Finance Ministry, and the Banks of Chosen, Taiwan and the Industrial Bank of Japan made a loan of twenty million yen to the Bank of Communications. And from these two sources the Premier had to obtain any additional supplies which he might require.

Seeing that it would be impossible for him to throw off the Chinputang without the creation of a new political party which would include both Chinputang and Kuomingtang members, the Premier appointed Chang Kuo-pan to act as his personal representative in reorganizing the Tao Lun Party, his idea being to secure quite a few of the old parliamentarians who at present belong to the Chinputang and Kuomingtang for membership in the reorganized party.

While engaged in forming this new political party in order to rid himself of the Kuomingtang and Chinputang influence in the proposed new Parliament General Tuan is also in battle as above mentioned against the South. He has sent General Wu Kwang-hsin to Szechwan, and General Fu Liang-tso to Hunan to try to settle the disorders caused in those Provinces by the Southern political leaders. The Premier is further embarrassed by the fact that the President and his immediate followers on the Yangtze are taking no active interest in the efforts being made to suppress the rebellion in the South.

The Chinputang party leaders are keenly interested in organizing the new National Council, though they have been rather disappointed because the Tuchuns of certain Provinces have taken it upon themselves to appoint members to the Council who are not Chinputang sympathizers. In those Provinces where President Feng Kuo-chang has his supporters in the position of Governor-General delegates will be appointed who are in sympathy with him, and a similar thing will happen where General Tuan Chi-jui's influence obtains.

It is not thought by the Chinese that the South will be defeated other than by the arrangement of a compromise whereby the Southern Tuchuns will eventually agree to the calling of a National Council, and in this event General Feng hopes, by keeping out of the present fight against the South, to gain their support in the event that a compromise is actually effected.

General Feng Kuo-chang showed by his delay in signing the three Mandates, issued recently for the purpose of calling a National Council, of punishing Sun Yat-sen and Wu Ching-lien and of inaugurating a new Parliament, that he is not in active co-operation with General Tuan. The latter is at present trying to oust the Chinputang and this action is apparently in accord with the views of the President who is also desirous of their elimination. The Chinese believe that General Tuan will find that he has done a great deal to ease General Feng's position by taking the blame for such a development, and that then he will have to retire from the Premiership. In this event General Feng will be at least temporarily in control of the situation. It is believed, however, that the Chihli military faction is loosely held together and that as soon as General Feng takes command he will encounter the combined opposition of the Shantung, Honan and Anhui military factions, and that at this juncture he will find opposing forces too strong for him. In other words, the idea of Tuan's followers is to have Parliament convened about the time that the new election will take place for the President, and that at that time the Tao Lun Party will have the majority membership in Parliament. This party will in that case endeavor to elect Tuan Chi-jui President and if they succeed it is thought by many Chinese that the Chiaotung Party will be in control of the Cabinet.

The difficulty foreigners have in determining the outcome of a political situation is, as we remarked at the outset, that there is no organization, and one has to depend entirely upon one's knowledge of the personal traits aud inclinations of the individuals in politics to come to some understanding. The whole situation is a purely personal one, and the only basis upon which one can come to any sort of conclusion is of course a personal one.

CHINESE AGRICULTURE AND IMPROVEMENTS

The War Commission appointed by the Chinese Government to investigate conditions with the object of facilitating the work which China might be able to do to help win the war is actively considering the food problem and the question of developing industry. The attention of the Commission was specially drawn to these two important matters by the last issue of this journal. Whether the Commission will be able to recommend effective measures for the improvement of crop production, which the Government will be able to induce or force the agriculturalists to adopt, remains to be seen, but it might well take into consideration some points. The average visitor to China who notes the complete absence of modern machinery on the farms at once jumps to the conclusion that herein lies the chief failure of the country to make good as a producer of cereals for export. This is not actually so. Machinery might well be employed in the great cultivated areas of Manchuria and in Inner Mongolia, and especially in opening up the vast unoccupied tracts in these regions, but it would not be adaptable to the greater part of China Proper where the holdings are small, where the population is dense and, therefore, where labor is plentiful and cheap. The Government might seek to effect some improvement, however, in the implements used by the average farmer, and in this direction, too, the foreign manufacturer might well investigate the field with the object of improving upon the crude tools which have been used by the Chinese for centuries and which must handicap him not only in effective work but also in crop production. Once it is proved to the Chinese that a new cheap tool will bring more earnings to his coffers he will not hesitate to abandon the implement of his forebears. Small "seeders" that could be pushed by hand or pulled by a donkey, small thrashing and winnowing machines, such as are used in handling the crops from test plots of experimental farms and agricultural colleges, and all manner of light implements which are not used on large farms abroad and which would there be regarded as mere toys should sell well in China. It has to be remembered that the crudest of crude implements are now in use throughout the land, and this type of thing our ancestors discarded generations ago. What would be regarded now as a toy on big farms abroad would strike the Chinese as a marvelous invention, especially if it is designed for man power. The Chinese farmer is also a potential customer for small man power machines to handle cotton, etc., at all stages, especially in ginning, carding, and weaving, while a small hand loom, well made, should also have a large field.

Seed selection, disease prevention, the use of fertilizers, and the provision of transport facilities—particularly the latter—constitute the chief avenues of endeavor which the Government might look into with something like real profit to the farmer and to the country. In the matter of seed selection a leaf might well be taken out of the book of Japan, and a few leaves might be torn out, too, with regard to the other points. In Japan there are methods of rice and cereal seed selection by solutions made up to a definite specific gravity for each variety common in Japan, which do not exist in China. The Chinese are unquestionably good manipulators of soils and good laborers, as a valued correspondent points out, but they expend the same labor whatever the quality of the seed used may be. What the farmer must be taught is that careful seed selection has a cumulative effect as years pass. The persistent elimination of light weights, etc., that float on the solution brings about a steady improvement in the yields from the same crop on the same area with the treatment.

Scarcely a thing is now done in China systematically to overcome the spread of disease. Seed picking or crop spraying is little known and little practiced, yet the annual loss from neglect in this direction must be tremendous. It is virtually unknown simply because there are no records of disasters of this kind. The farmers are the only ones who care, and they accept adverse visitations as the will of the gods or a manifestation of the bad temper of the village joss who has not perhaps been propitiated sufficiently. And instead of investigating to ascertain the cause of the trouble the farmer merely sacrifices an extra pig or two and burns a few more joss sticks in the firm belief that next season, the anger of the gods will be assuaged and all will be well. In this sphere of activity the Government could by systematic effort and scientific application discover and extirpate many sources of trouble and loss.

Modern fertilizers are practically unknown in China, and China is the only country now where nitrate of soda is not classified as a fertilizer, and where difficulties are made about its import. It must be said that this is due to misunderstanding, owing to the anxiety of the Government to prevent the illicit manufacture of explosives by rebels, but the precautionary measures are overdone to the great handicap of agricultural development. There is room in China for the annual consumption of large quantities of superphosphate, nitrate of soda, sulphate of ammonia, and other fertilizers to raise the annual yields, and an expert on the subject expresses himself as confident that the proper use of fertilizers alone could raise the agricultural output by 20 per cent apart from other improvements. The use of modern fertilisers does not mean displacing any one of the old means by which the Chinese conserve the fertility of the soil but would be supplementary thereto. The good handling of the soil, the conservation and use of waste materials already practiced in China, and alluded to in last issue, leave, as it were, an unfinished structure which the use of fertilizers would complete. One of the first steps the Government should take to place the farmer on a fair footing is to remove the embargo on the importation of nitrate of soda, etc. In this direction the lead of Japan might well be profitably followed. Prior to the war the import of fertilizer raw materials into Japan amounted to some 10 to 11 per cent of the total import of the country. The Japanese Government caters to the farmer by making all fertilizer materials free of Customs duties, and their import is encouraged in every way to promote the agricultural production of the country.

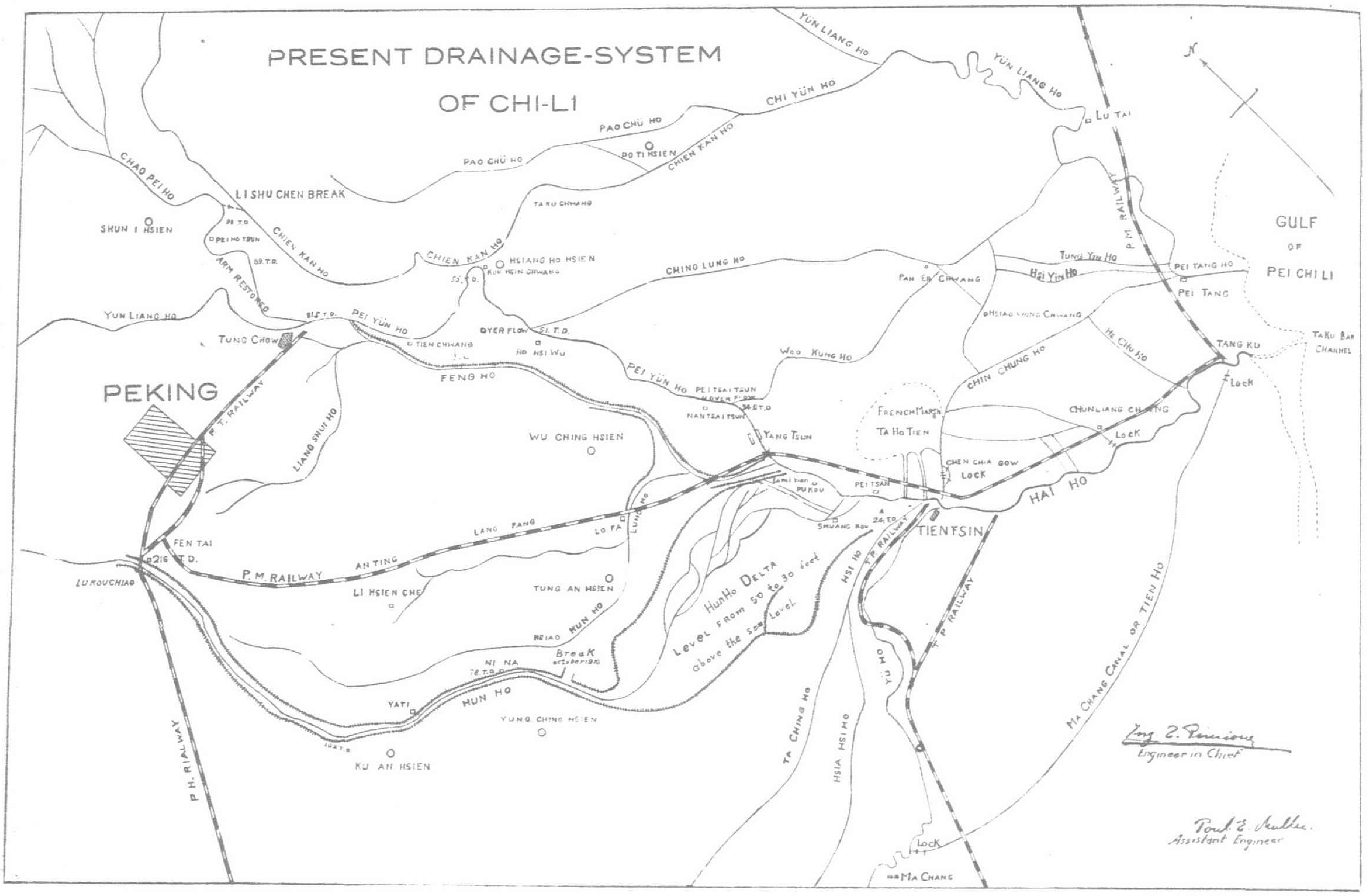
In the construction of roads in all directions to enable the farmer to get his produce to market, the Government can act at once. There is no excuse at all for delay. There is labor in abundance, and there is no need of imported money or materials. China possesses everything necessary for road building, and more so than any other country, since labor cost is the chief item. Because there are no made and properly maintained roads, the farmer finds his prices compulsorily raised by cost of transportation, or he is compelled to grow but what he can consume himself and sell in his immediate vicinity. If he has a surplus crop he has no means to get it to market unless he is situated comparatively close to some railway, river, or canal, and if he lives well in the interior he is compelled to burn his surplus or turn it in the ground. The lack of roads is an outstanding disgrace. While railways are necessary, the road can do infinite work for the farmer, specially if modern power-driven vehicles are used for transport purposes. A good road campaign is one of the things which the people of China should launch and sustain till power vehicles are to be seen all over the country.

THE FLOODS OF NORTH CHINA

Vast areas in Chihli Province and in other provinces have been inundated this Summer by the failure of rivers to carry their unusual burdens of rain water to the sea, and the failure can be attributed to the lack of systematic attention to conservancy work by Chinese officialdom in the past. Ruthless deforestation, the haphazard erection by villagers of hundreds of thousands of miles of dyke without any scientific direction, the callous indifference of the governments of the past to the teachings of early flood lessons are solely responsible for the great toll in lives, in property, and in money, which the waters are now taking. The policy of previous generations of allowing posterity to take care of itself is prolifically bearing its fruits of bitterness.

No recent government can escape responsibility for the disaster by pleading lack of knowledge of conditions. Prophetic warnings have been made many, many times in the past decade by responsible foreign engineers, by foreign residents in, or travelers through, the effected areas, and by writers of every nationality whose eyes have seen, whose intelligences have been awakened, and whose hearts have been moved by close and painful proximity to the sufferings of the people whose homes and crops over vast areas have been buried feet deep in silt and sand in a night, as it were, and hundreds of thousands of whom have been drowned or starved to death by resultant famine in the devastated regions.

Before the railway system reached the stage at which it now stands, great disasters were little known to the outside world, and the area of suffering could be reached only with difficulty. Losses of millions of lives wont to be accepted as the inexorable law of nature operating to regulate population in this land of plural wives and prolific child birth, and when the outside world did not know of the almost annual toll of lives the outside world could not care. But as soon as conditions arose enabling the gravity of periodical flood and famine situations to be realized by the Europeans resident in or visiting the country a hue and cry arose for attention to conservation questions, and this hue and cry fluctuated in proportion to the extent of the disasters and the interest of the officials. With each recent great disaster there have been millions of dollars spent on relief work, mostly contributed by foreigners, great plans for preventive work have been made—but



with the diminution of the distress effected by the distribution of relief came a collateral diminution in the desire for the undertaking of permanent preventive works. Plans have been allowed to become dust-covered in the limbo of forgotten things, and officials have lapsed into peaceful indifference of public questions until suddenly aroused by some new assertion of prepotent nature's right to penalize the procrastinating human.

So the Chihli floods have come again. But this time with a difference. Where they have merely affected the native before, they have this time very boldly and badly hit the foreigner, and because of this it is certain that the Government will be forced to take action where hitherto it has been able to ignore the claims of the common people. Because the flood waters have menaced Tientsin the great population in the valleys of the untrammeled rivers will have a chance at last of permanent protection, for the time has come when the Government must be compelled by foreign influence if not by realization of the claims of the tax-paying people who have been ruined to undertake an effective scheme of conservancy, which will embrace all of the northern rivers at least.

The disaster, which has involved Tientsin, is due solely to the deforestation of the regions forming the watershed of the four or five rivers concentrating near Tientsin to use the channel of the Hai-ho river to the sea and the unscientific dyking of the country through which they flow. The main waterways concerned are the Peiho, the Hunho, the Tachingho, the Hsiahsiho, and the Yuho, or Grand Canal. The first four come from the uplands of western Chihli Province and Shansi Province. Thence they tear down the steep gradients, unrestrained by any plant growth, bringing with them millions of tons of sand and soil annually. This they distribute with lavish prodigality over tens of thousands of square miles at different times. The heavier detritus, such as stones and gravel, is deposited over the erstwhile fertile regions at the base of the mountains, the sand is carried over longer distances, and the silt is transferred in suspension for thousands of miles to the sea, or, where the waters become stilled by dykes or obstructions, it is deposited on the land. This year in the Hsinmintun district of Manchuria the Liao River floods deposited ten feet of sand over great areas, burying villages, and devastating wide stretches of fertile lands. The rivers concentrating on Tientsin have inundated over fifteen thousand square miles, wiping out villages by the thousand and homes by the million, destroying crops estimated at a low figure to the total value of from $70,000,000 to $100,000,000, and homes calculated at only $3 silver each, to the value of $30,000,000. This is an extremely conservative estimate, for it does not take into consideration personal effects or farm property or animals. These items, added to the foreign loss of property and trade at Tientsin, must make the figures in the ultimate reckoning stupendous. Yet it is certain that the whole of the disaster could have been averted by intelligent processes, if applied in recent years only, for a sum totaling half of the damage caused to the Chinese farmers alone.

How the harnessing of the recalcitrant streams is now to be effected is being considered by the engineers concerned in the protection of Tientsin, but unhappily the task presented to those competent to deal with the matter savors very much of slamming the stable door after the horse has taken to his heels. For some years now Mr. Vanderveen, Consulting Engineer to the Chinese National Conservancy Bureau, has been urging the Government to take in hand the problem of the Yuntingho—("ho" being the Chinese for River) since that river's activities in flood times materially affects the procedure of several others, the Hunho and the Haiho (on which Tientsin is built) in particular. The Hunho has brought down sand and silt from the mountains west of Peking in such great quantities that it has raised its own bed in places some 20 feet above the surrounding country, and when breaks occur in the dyke it also raises the areas which it floods, the whole augmenting the seriousness of dyke breaks in the Yuntingho. To overcome the chief difficulties, and save the port of Tientsin from floods such as those now being experienced, Mr. Vanderveen recommended the Government to undertake work calculated to provide the Yuntingho with a separate outlet to the sea. At present it uses the Hai-ho, which is incapable of carrying all the flood waters of the rivers pouring into it, and which must necessarily silt up in course of time, despite the dredging work being carried on by the Hai-ho Conservancy Board, by the very fact that the onrush of detritus in times of heavy rains is overpowering. The capacity of the Hai-ho is but one fifth of that of the Yuntingho itself, so the advantages of a new opening are obvious. "In the first place," as Mr. Vanderveen says in his report to the Government in 1916, which supplements a previous report in 1915, "the Haiho will be freed from the enormous quantities of silt brought down at present, and the bar at the entrance, at present such a severe hindrance to shipping, will, if it does not gradually disappear, become much smaller. In the second place the outlet can be made sufficiently large to cope with the volume of water brought down by the Yuntingho during freshets, and in addition the new course, leading as it would through the low country known as the French Marshes, or Tahotien, could be utilized by systematic dyking to raise all of the low-lying area and so make it valuable agricultural land. If in the meantime afforestation is taken in hand the silt problem will, long before the new river bed has been raised too much, have ceased to exist and the Yuntingho will henceforth have no more vices than any other river." In his concluding paragraph, Mr. Vanderveen expressed the opinion that only on the lines suggested could the trouble of the rivers be averted. "Other methods may give temporary relief," he pointed out, "but in the long run they will prove a failure and the same old problem will have to be faced anew, after millions have been spent in vain. Moreover the evil might reach such proportions in the meantime that no remedy will exist. Then Tientsin is doomed and will cease to exist as a port."

While there might be differences of opinion among engineers as to the steps proposed by Mr. Vanderveen, we briefly mention them solely to show that he at all events consistently urged the Government to take some steps with a view to averting a disaster than it now has to confront.

Now that Tientsin has been menaced the engineers will combine no doubt to find a solution, and in course of time they will submit recommendations to the Government which will embody the results of their investigations and experiences. In this way only can the rivers be dealt with, and we hope very soon to be able to publish the sense of their recommendations, and also to report action on an adequate scale by the Central Government.

SIEMS-CAREY RAILWAY AND CANAL COMPANY

The most enthusiastic reception ever given by Americans to a foreign contract in China was when the official announcement was made of the signature of the Agreement between the Chinese Government and the Siems and Carey partnership on May 17, 1917. This contract called for the building of 2,600 miles of railway in the Republic, and its terms were undoubtedly the most attractive ever offered to outside investors by the Chinese Government. Now, however, Americans are beginning to view with alarm the reports circulated throughout China to the effect that the Siems-Carey Railway and Canal Company are finding it difficult to proceed with their work; reports to which credence is unfortunately given by the resignation of Mr. Roy S. Anderson and Mr. Geo. A. Kyle, the former as an officer of the Siems-Carey Railway and Canal Company, and the latter as Chief Engineer of the Chuchow-Chinchow Railway and the Chou-Hsiang Railway. It was through Mr. Anderson that Siems and Carey were able to negotiate the original Agreement, and, as is generally known, he at all times rendered the American International Corporation and its allied companies in China most valuable services. Mr. Kyle has proved himself a most competent and popular occupant of his office as Chief Engineer, and it is with regret the Chinese Government views his resignation.

There are certainly difficulties in the way of the American International Corporation in its work in China, but they can be overcome, and we sincerely hope that the organization will lose no time in using its very best endeavors to clear up the present muddle if only to free other American investors desirous of doing business in China from suspicion on the part of the Chinese as to their real intentions. American interests are undoubtedly suffering very much from the continual failure on the part of American business men to carry out contracts entered into by them, and curiously enough the Chinese Government is nearly always blamed for the failures that have marked the the winding up of many American enterprises in the past. It is, however, hardly fair to place all of the blame upon the Chinese authorities, since other than Americans have in numerous cases successfully negotiated and carried out important contracts in similar conditions.

The American International Corporation came into China with quite a generous amount of advertising in the press of China and America, and because of this fact any failure upon their part to consummate their contracts will tend to greater publicity of their failure. We regret to hear that the consensus of opinion is that the Corporation has unfortunately made the mistake committed by so many of its predecessors in engaging services of men inexperienced in foreign business to head their work in China. The Chinese Government is most desirous of forming business partnerships with American interests in the development of China, and it is to be hoped that large American financial concerns like the American International Corporation will thoroughly probe to the root of American failures in order that the prestige of American business men will not be further endangered.

THE KIRIN-CHANGCHUN RAILWAY LOAN

On October 12 the Minister of Communications at Peking (Mr. Tsao Ju-lin) signed an agreement with the Yokohama Specie Bank for a loan of Yen 6,500,000, with the Kirin-Changchun Railway as security. Of the total amount of the loan Yen 2,150,000 have already been paid to the Chinese Government.

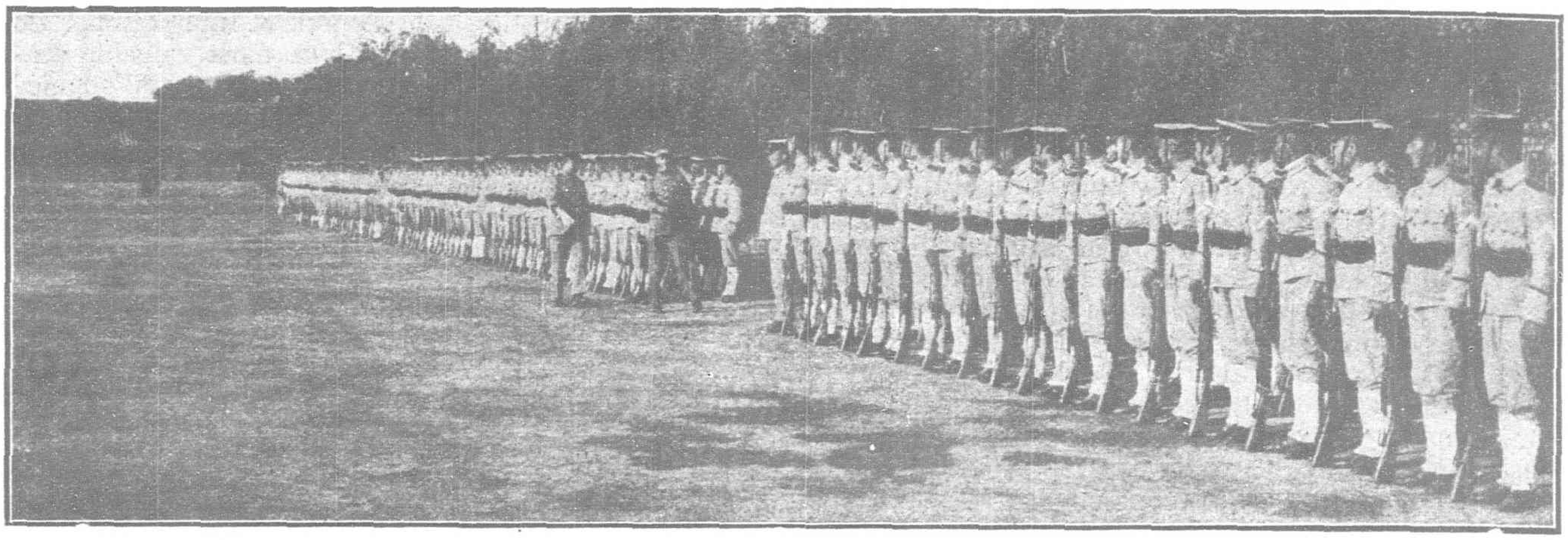
The interest is 5 per cent per annum, and the Government is to receive 91½ per cent as net proceeds. The term of the loan is for 30 years, the security being the property and revenue of the Kirin-Changchun Railway.

During the term of the loan, the South Manchuria Railway Company is to undertake the management of the line and will receive two per cent of the net profits as expenses.

The Chinese Government is to appoint a director to supervise the affairs of the railway, while the South Manchuria Railway Company is to appoint chiefs for the engineering, transportation, and accounts departments.

Conferences are to be held to adjust transportation facilities at Changchun between the South Manchuria and Kirin railways.

This loan is the development of the arrangements made with China by Japan to take over the Kirin-Changchun Railway on a loan basis, and henceforth its management will be conducted by South Manchuria Railway Company as part of the Manchuria railway system.



"EYES RIGHT!" CHINESE LEGATION GUARD, PEKING

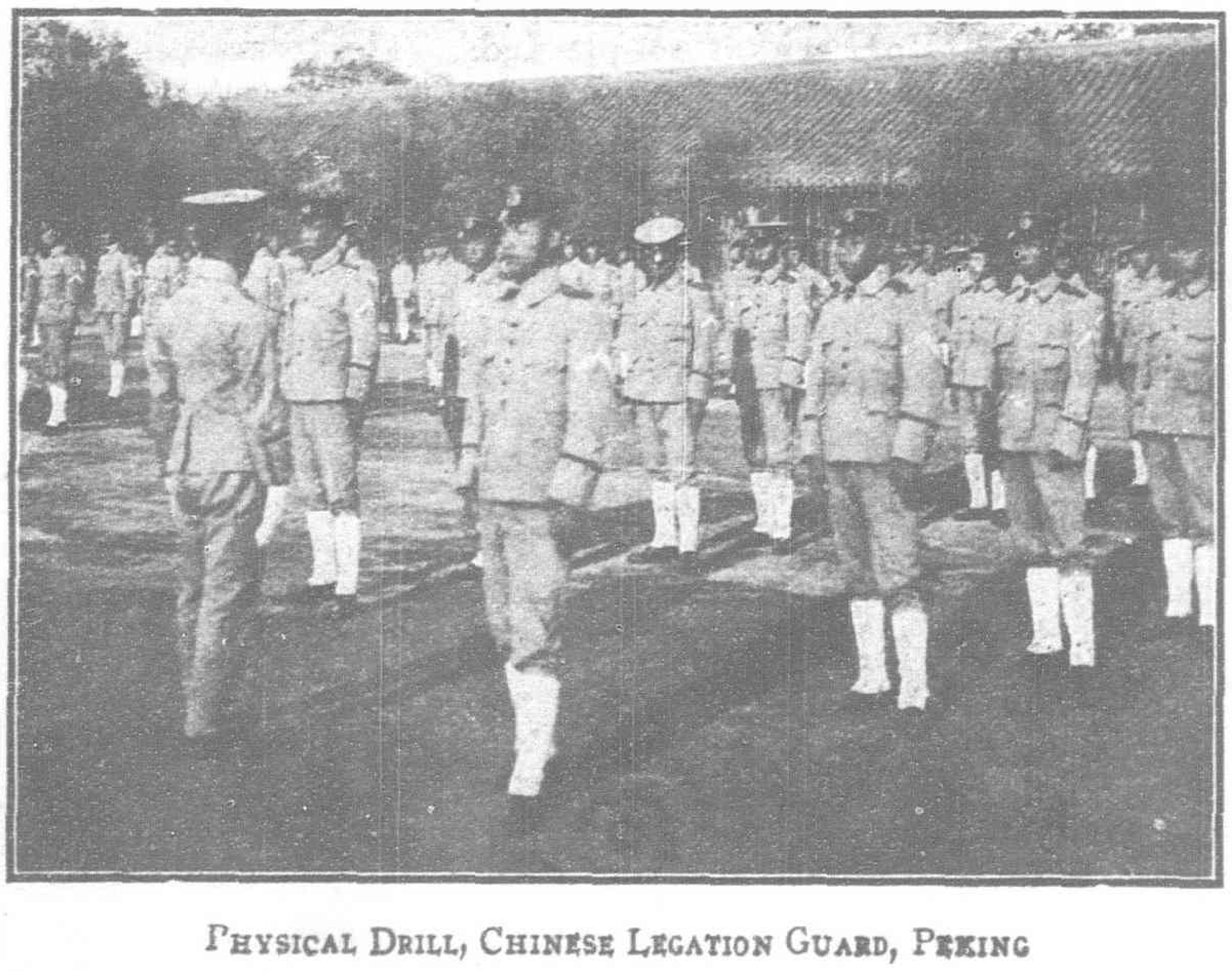
China's Man Power*

In the last issue of the REVIEW we published an article on China's Man Power as Soldiers and Laborers, by General J. W. N. Munthe. Since then we have been able to view sections of the military element on parade, both the regular army and the force specially formed for the protection of the Legation Quarter. On October 10, the anniversary of the outbreak of the revolution which ended in the overthrow of the Manchu régime and the establishment of the Republic, the President reviewed some 20,000 men at the camp south of Peking.

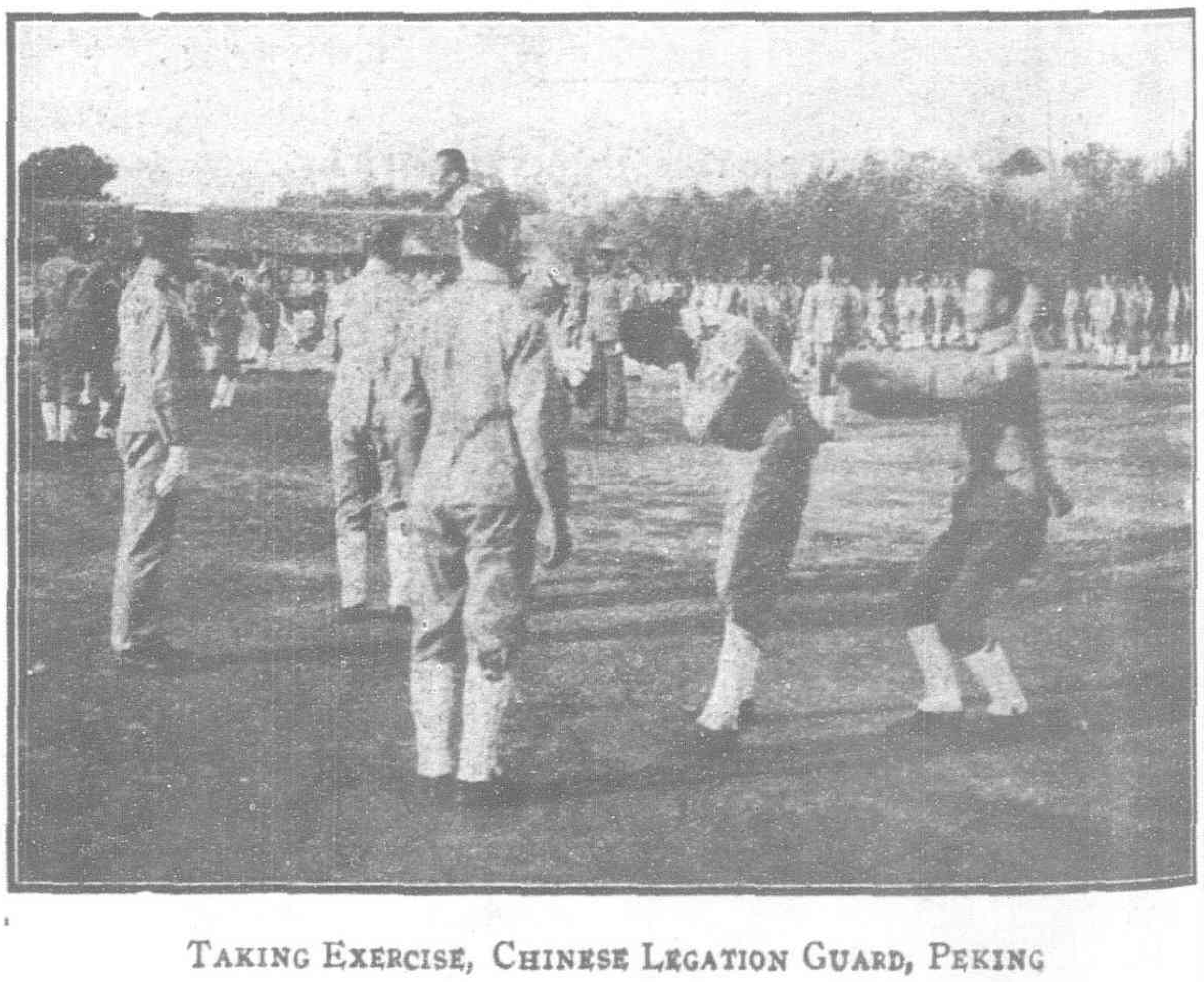
Physically the troops were excellent, while their marching and general deportment elicited extremely favorable comments from several foreign military attachés who were present. The drill was carried out in a manner comparable with that of the best foreign regiments and demonstrated beyond cavil the valuable human asset which China possesses. These forces are, of course, drilled and commanded solely by Chinese officers.

There is only one force under foreign command, and that is the Pao An Ching Cha, or Chinese Legation Guards. General Munthe is in command, and with him are three other Swedish officers—Majors Taube, Berg, and Lonnevig. The Guard was established in 1914, at the outbreak of the war, when it became necessary to withdraw the bulk of the foreign Legation Guards, and it was then intended to make the strength up to 3,000. Lack of funds prevented the consummation of this scheme, and a corps of about 570 was formed as a nucleus. The men are selected from the police force as far as possible, and constitute a fine body of men. At a parade in the early part of the month, which was viewed by the British Chargé des Affaires, Mr. Bielby Alston, and the British Military Attaché, Lieutenant Colonel Robertson, among others, the most convincing demonstration was given of the efficiency that can be attained by the Chinese under foreign direction. The men were put through evolutions as well as manual exercises, and displayed exceptional precision in their response to orders. In the manual exercises they were splendidly capable, while in maneuvers they were no less efficient. In all, the display was one which evoked the highest encomiums, and afforded unquestioned proof, if such were needed, that the Chinese will make soldiers as fine as can be produced anywhere, provided they have the training and the leaders. General Munthe and his officers have managed to get the best out of their men and at the same time make them proud of what they can do.

The barracks, no less than the drill, show that the Chinese can comply with the foreign idea of hygienic living, for they



PHYSICAL DRILL, CHINESE LEGATION GUARD, PEKING



TAKING EXERCISE, CHINESE LEGATION GUARD, PEKING

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*In the article by General Munthe, published in last issue, there were two errors. In the last line of the first column of page 688 the sentence begins "Bread is almost entirely absent, etc." Instead of bread the word should be *meat*. In the next column where it is said that "in the army the soldier is allowed 75 catties of rice per month" the figures should be 45 catties. These inadvertent errors are likely to create a wrong idea unless corrected.

were found to be spotlessly clean. Hot baths, barber shops, mess rooms, dormitories, schoolrooms, and armories were as clean as could be found in any barrack rooms in the world, which fact simply proves that though the Chinese are inclined to be dirty by habit they can be drilled akin to godliness and still endure it. The men are educated in Chinese police law, etc., and some sixty of them study English, while other subjects are also taught. In general appearance the Guard looks cleaner than the regulars; they certainly dress better, and all round they reflect the highest credit upon those who have been responsible for their drill and instruction.

COTTON MILLS AND MACHINERY IN CHINA

The cotton mill and cotton machinery problem is receiving much attention in Shanghai consular district, where this industry is chiefly represented, says Consul General Thomas Sammons. However, while the cotton manufacturing industry in China may at present be a profitable investment for a Chinese, it does not follow that it is profitable for one living outside of the country. This is on account of the abnormal state of affairs brought about by the present exchange market, the far-reaching effects of which all foreigners in China fully realize.

To the Chinese the present situation offers certain distinct advantages. His silver money will buy practically as much land, raw material, buildings, and labor as it ever would, and furthermore it can purchase far more gold with which to pay for machinery than has been possible during recent years. On the other hand, in contrast to the Chinaman, the American or British investor, living in a foreign land and measuring his wealth in gold, who contemplates investing his money in some industry in China, will find that he must pay an exorbitant sum for silver with which to buy land, buildings, raw materials, and labor, and he will be running the risk that should exchange return to a level equal to the "normal" of the last 10 years, then the dividends from this undertaking may not buy sufficient gold to warrant the investment in the first place. Consequently, the foreigner frequently hesitates at this time when the Chinese is looking at the situation as one affording him a great opportunity for investment.

An interesting report of the annual general meeting of the Oriental Cotton Spinning Co., at Shanghai, directs attention to the fact that the business of cotton yarn spinning in China was not uniformly profitable during the year 1916. The indebtedness of the company increased 34 per cent during the year, notwithstanding the fact that conditions during the latter half of the year improved and allowed a profit on the business during that period. The cause of the loss is given as the poor demand for yarn as a result of the political unrest in China during 1915 and the first half of 1916, and the high price of cotton. However, the outlook for the future is said to be promising.

As a result of the unprofitable year's business, it was decided at a stockholders' meeting held immediately after the general meeting that the yarn-spinning company should be liquidated and the deficit thus obliterated and that a spinning and weaving company should be organized. The reason for this action was stated to be that the results of local mills for the past year have demonstrated that only those mills that have weaving plants have worked at a profit and that in unfavorable years mills having looms have been able to do a profitable business through the sale of their cloth when a profit could not be made on yarn.

It would seem from the action of the company referred to that any concern that might hereafter consider the erection of a cotton spinning plant in the Shanghai district should seriously weigh the advantages of being able to weave as well as to spin cotton.

As an example of the progress of China and the Chinese in the field of manufactures, the recent official opening of a large cotton mill at Wusih, located in the Shanghai district, may be cited. This concern, which is reported as having an authorized capital of about $500,000 and a subscribed capital of nominally $400,000, has been erected within the last two years. It is equipped with some 15,000 ring spindles as its present equipment, but it is capable of being increased to 200,000 or 250,000 spindles as its ultimate capacity. It is a duplicate of another cotton mill already established at Wusih, the yarn from which sells at a higher price than that from other mills, the machinery being, it is said, of an improved type. All of the machinery in this particular mill was imported from England.

JAPAN'S MACHINE POWER FACTORIES

Japan's machinery manufacturing industry has made marked strides since the creation of war conditions, the activity looming most prosperous with the shipbuilding trade. The total number of mills manufacturing by machinery and employing men of 18 years and above was 1,180 of which 230 were incorporated. The number of workmen totaled 298,158 with an aggregate amount of production valued at 250,449,770 yen. The above covers only the private concerns. The value of output according to trade may be given as, in the ship and car building it was 74,507,745 yen; in the machinery construction lines the value of the production totalled 49,006,909 yen; in the manufacture of measures, scales, and munitions 11,711,795 yen; in the metallurgical lines such as the manufacture of steel materials, copper wires, etc., 69,003,565 yen and miscellaneous 1,230,051 yen.

There are 1,180 plants as aforesaid but those which employ 100 men and above number 88 while those employing 500 and above number only 27. There are only 230 firms under the company and corporated system which is only about 20 per cent of the total number of mills, the aggregate capital of which is given at 77,000,000 yen. The shipbuilding yards and railway car manufacturing plants are mostly of large scaled concerns but those engaged in the making of various kinds of machineries those turning out electrical, manufacturing, spinning machineries, munitions and scales numbering something like 20 factories carry on their operations in a rather large scaled manner. Thus the conditions of the manufacturing industry of Japan are good proofs to show the developments made in the last few years. The total amount of manufactures was valued over 250,000,000 yen last year as compared to the 200,000,000 yen of the year before.

JAPANESE SHIPOWNERS

According to the returns made public by the Department of Communications, the nine shipowners with the largest tonnage in Japan are as follows:

Shipowners	Ships over 1000 tons	Aggregate tonnage
Nippon Yusen Kaisha	99	455,734
Osaka Shosen Kaisha	58	191,463
Toyo Kisen Kaisha	10	80 811
Yamashita Kisen Kaisha	15	40,892
Mitsui Bussan Kaisha	11	35,064
Nisshin Kisen Kaisha	12	29,663
Mr. Ginjiro Katsuta	7	26,085
Kishimoto Kisen Kaisha	6	25,652
Uchida Kisen Kaisha	7	20,027

The firms with over 20,000 tons of ships registered in Kuantung Province are as follows:

Kashimoto Kisen Kaisha	7	30,252
Ryoto Kisen Kaisha	5	20,128

With its recent increase in capital fully paid in, the Yokohama Dock Company, which is now capitalized at Y.10,000,000, is rapidly extending its plant. Permission has been granted by the Kanagawa Prefectural Government to the Yokohama Dock Company to reclaim the foreshore of the plant to the extent of 6,676 tsubo.

Altogether Y.110,000 will be invested in this reclamation project. As soon as the new site of ground is reclaimed, construction will be started on five more berths, including one which will be capable of building a ship of 30,000 tons displacement. There are only two berths at present, one for 1,500-ton and another for 2,500-ton vessels.

AGRICULTURE IN THE PHILIPPINES

Few authoritative figures have ever been published regarding agriculture in the Philippines. This fact lends special importance to data collected by the Philippine Bureau of Agriculture and now made public by the Bureau of Insular Affairs at Washington. The statistics compiled from reports submitted by the executive officers of 1 city, 763 municipalities, 84 townships, 25 rancherias, and 11 settlements, show that little more than one twelfth of the whole area of the islands is under cultivation.

The total area of the Philippines, including in all 3,141 islands, islets, and reefs, has been reported by the Manila Observatory to be 119,542 square miles, which is equivalent to 309,615 square kilometers, or 30,961,500 hectares; but the area under cultivation in the six principal crops and three minor ones in the year ended June 30, 1916, was only 2,621,077 hectares, or 8.5 per cent of the whole area of the islands. Rice was grown on 1.140,829 hectares (hectare=2.471 acres), abaca on 500,317, corn on 432,766, coconuts on 275,769 (the average planting being 200 trees per hectares). There were 1,074 hectares devoted to cacao and 844 to coffee.

The reported yield from this area and the value of the crops (expressed in Philippine pesos of $0.50) are given as:

Products		Amount Produced	Total Value in Municipal Markets *pesos*
Abaca (Manila hemp)	kilos[1]	152,756,278	42,767,339
Cacao ...	do	[2]558,357	[2]345,059
Coconuts and Coconut products:			
Ripe nuts for food	number	63,818,406	2,177,343
Copra ...	kilos[1]	141,764,193	19,016,096
Oil ...	liters[3]	2,688,305	713,288
Tuba ...	do	53,938,612	2,524,228
Coffee ...	kilos[1]	[2]752,196	[2]361,754
Corn, shelled	liters[3]	496,270,874	14,723,962
Maguey (cantala)	kilos[1]	13,389,722	1,747,263
Rice, rough	liters[3]	1,565,914,802	55,923,821
Sugar and Sugar-cane products:			
Crude sugar	kilos[1]	350,281,946	31,283,764
Panochas (small cakes)	do	23,730,795	2,173,998
Basi (a beverage)	liters[3]	6,753,324	500,560
Molasses	do	2,216,638	177,812
Tobacco, leaf	kilos[1]	41,139,174	7,259,169
Total ...			181,695,456

The area devoted to fruit trees, bananas, and camotes (a variety of sweet potatoes), ubi (uvi yam), gabe (the taro), and other vegetables is not included, as complete crop statistics for these products are not available.

Abaca (Manila hemp), sugar, copra, and tobacco are the four leading export crops and the ones best known in the United States. The rice crop, which ranks first in point of value, is not sufficient for the islands' own needs, and large quantities of this cereal are annually imported into the archipelago, though the Philippine Bureau of Agriculture is endeavoring to extend its cultivation.

As stated above, 500,317 hectares were under abaca cultivation in the fiscal year 1916; of the area, however, only 331,876 hectares were harvested. Albay, Ambos Camarines, and Sorsogon Provinces, in the island of Luzon, and Leyte Province, in Leyte Island, are the leading producing centers. Leyte had the largest average yield.

Occidental Negros is the leading sugar Province, with Pampanga, Batangas, and Iloilo next in order in the matter of cane area, these four Provinces having, respectively, 29.8 per cent, 16.1 per cent, 8.4 per cent, and 8 per cent of the total area under cane cultivation in the year ended June 30, 1916. In value of their products Occidental Negros again ranks first, with 40.2 per cent; Pampanga is second, with 13.1 per cent; but Iloilo is third, with 7.6 per cent, and Batangas fourth, with 5.3 per cent. Cebu and Oriental Negros were the only other Provinces whose output of sugar-cane products in the year under review exceeded 1,000,000 pesos; the former furnished 3.9 per cent of the total value from 3.6 per cent of the total area under cane cultivation, the latter 3.2 per cent of the value from 2.4 per cent of the land.

The value of all sugar-cane products was 34,136,134 pesos, made up of crude sugar, 31,283,764 pesos; panocha, 2,173,998 pesos; basi, 500,560 pesos; and molasses, 177,812 pesos.

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[1] Kilo=2.2046 pounds avoirdupois. [2] Estimated. [3] Liter=0.9081 dry quart or 1.0567 liquid quarts.

REVIEW

"The Menace of Japan"

A recent book by Frederick McCormack, a well known journalist, upon the relations of the United States of America with Japan in the Far East, and particularly in China, has created no little sensation among Japan's protagonists in America and has been the subject of the most scathing reviews in the publications which either carry the Japanese propaganda or support the Shibusawa scheme of Japanese-American cooperation in the Orient. The book, which is entitled "The Menace of Japan" (Little, Brown and Company) is undeniably sensational. It was evidently written by a journalist used to handling the sensational, and was written to stimulate discussion. It is not a scholarly study, though the facts seem accurate and carefully verified, but as an expose of Japan's political aspirations and diplomatic methods in East Asia as compared with the halting, vascillating, and always over-careful policy adopted by America in the same quarter, in the protection of her own interests and in the protection of other interests over which she has a responsible guardianship. The book was evidently put together under the inspiration of a 17th century pamphleteer, but is nevertheless readable and the succession of revelations which the writer punctuates with a gusto more suitable to the propagandist than the political student, serves to sustain interest throughout.

Mr. McCormack's first purpose in writing the book is evidently to show by a historical review of events in which Japan and America have been involved in the Orient, that American diplomacy has been altogether too feeble and too ill-furnished with knowledge, courage, and backing from home, to cope in any way with the determined aggressive policy of the Japanese Government to expand, in Manchuria particularly, and in China generally, to confiscate all interests, native or foreign in the Orient, and to gain supreme control of the Pacific. He gives in great detail, and with an effective recital of circumstances, the story of the shaping of the Komura policy in Japan after the Russo-Japanese war, from which period he traces the anti-American movement in Japan and the official rejection of America as Japan's friend and instructor. He shows how American diplomacy after this period gave way step by step, lost ground through blunders or weaknesses; and how Japan, with rigid determination and a ruthless ambition to be rid of her rivals and to crush opposition to her expansion on the continent, availed herself of political jealousies among the Powers and of Chinese weakness to advance by great strides.

The position of America in the Pacific and in the Orient is painted in the blackest colors, and the conclusion is drawn that America has given so much ground everywhere west of her California 3-mile limit that she must either make a frank withdrawal from the Orient, an open surrender, or fight. Mr. McCormick exhorts the Americans to prepare to fight, and thinks a Japanese-American war would be wholesome for Japan. This book was published last March, and was of course written some months earlier, so that in judging it one must take into account the fact that America was not then in the Great War, that she was not making the feverish preparations to arm herself that she has been making for the past few months, and that she had not then come into such close and intimate touch with France, Russia and Great Britain. Had Mr. McCormack's book been written a year later the body of it might have been much the same, but the conclusion would probably have been different. He would have had time to observe a radical change in Japan's attitude towards America, a rapid rise in America's moral stock in Japan, China, Russia, and in Europe generally, and to have seen the decline of anti-American jingoism in Japan set in.

It is impossible to pass upon the historical value of the book, for the reason that many of the writer's conclusions are based upon hitherto unreported conversations, pacts, and understandings between prominent persons, and are therefore of a nature which time and public criticism will correct or verify, but which no single reviewer can pronounce true or untrue. The facts involved in historical incidents which are public property are accurate and are not exaggerated. The spirit of the book, though a trifle bombastic, is in harmony with the spirit of most foreign residents in the Orient, and the conclusion, in which Mr. McCormack openly advocates war between America and Japan as a check upon Japanese arrogance and aggressiveness, and as a means of restoring American prestige in the East, portrays the climax which most Americans in the Orient believed inevitable a year ago, but which changing conditions, particularly America's entry into the war and Japan's marked change of manner, make neither likely nor desirable.

Whatever one may think of the literary merits of the book it portrays Japan accurately in a role in which Americans were exceedingly loth and slow to recognize her, and there is a spirit in the arguments presented which will convince the American people of the real imminence of a conflict in the Orient, which has been stayed by nothing but America's warlike preparation for the big conflict in the Occident.

ECONOMIC ACTIVITIES IN KOREA

It is a noteworthy fact that in consequence of the prosperous financial condition in Japan, capitalists have recently shown themselves inclined to invest their capital in undertakings in Korea. Making a summary of their plans, the *Seoul Press* finds that at least ten manufacturing or mercantile companies have recently been projected or established in Korea. The establishment of the Chemulpo Dock Company, promoted by Mr. T. Okudo and others, with a capital of 150,000 yen, has already obtained official permission.

The projected sugar refinery at Pyongyang, capitalised at five million yen, and the Pyongyang branch of the Onoda Portland Cement Manufacturing Company with a capital of two million yen have also obtained official permission for their establishment. The establishment in Seoul of a rice and bean exchange has been separately applied for by capitalists in Seoul and in Japan, while similar institutions are also being projected in Kunsan and Fusan.

The Chosen Match Manufacturing Company capitalised at 500,000 yen, and the Oriental Tobacco Manufacturing Company capitalised at one million yen, have also been recently promoted and official permission applied for.

ENGINEERING, FINANCIAL, AND INDUSTRIAL NEWS

RAILWAYS

Chinese Eastern Railway.—According to Japanese press dispatches the Russian vice-Minister of Communications passed through Harbin for Dairen on October 21 for an unknown mission, but it is believed the dispatches say, he is going to meet Mr. E. Hioki at Dairen for the discussion of railway affairs and perhaps to complete the unfinished agreement between Russia and Japan concerning the transfer of a certain portion of the Chinese Eastern Railway to Japan. The section which Japan will purchase is that between Kuanchengtse, near Changchun in Manchuria, and the Sungari River, and the monetary consideration which this deal involves, while not officially stated, is understood to be Y.30,000,000, about four times the amount which was estimated by Japan when this country first began to negotiate for the railway. This transfer of a section of the railway from Russia to Japan was a sort of supplementary agreement to the Russo-Japanese Convention which was signed on July 3, 1916, in Petrograd. The section of the Chinese Eastern Railway from Kuanchengtse and the Sungari River, and the rights of navigation on the river were considered as two conditions to the convention, but the Okuma Ministry fell without giving finality to the question. The Terauchi Ministry succeeding, the question was eagerly studied and negotiations pushed vigorously, it is understood. But owing to the Russian Revolution and the overthrow of the old *Rėjime*, negotiations were delayed. In the meantime, the Terauchi Ministry created the Advisory Board on Foreign Affairs and executed the plan for the unification of the administration of Korea and Manchuria. It is now declared that a meeting point was recently discovered between the two governments. The question of the rights of navigation on the Sungari River has been deferred, reports the Nippon Dempo News Agency, which says the two countries decided to pay full attention to the transfer of the railway. The price to be paid, the Nippon Dempo understands, will be about Y.30,000,000.

Ssupingkai-Chengchiatun Railway Prospects.—A traveler returning from Mongolia says that the construction of the Ssupingkai-Chengchiatun Railway would have been completed by November as anticipated had not floods inundating the region put back the work. There is no doubt, however, that Chengchiatun will greatly enhance its importance as a distributing center when the railway comes into existence. It is said that in four districts of Taonan, Kaitung, Chingan and Kwangan, about 1,000,000 bushels of kaoliang, 150,000 bushels of beans, 500,000 bushels of Italian millet, 250,000 bushels of millet, 100,000 bushels of wheat, 10,000 bushels of oats, 250,000 bushels of Indian corn, and 250,000 bushels of sorghum are produced annually, without mentioning buckwheat hemp, animal skins, wool, fish, herbs, etc. At present, not more than 250,000 bushels of agricultural products are shipped to Chengchiatun from Taonan every year, but the railway will bring these two distributing centers much closer.

The existence of the line also will improve trade relations with Kailuhsien. The amount of farming products raised annually in the district are said to be 500,000 bushels of kaoliang, 350,000 bushels of beans, 15,000 bushels of millet, 15,000 bushels of wheat, 20,000 bushels of oats, and 5,000 bushels of Indian corn. In short, the trade flowing to and from Chichihar and Harbin, or Hsiaokulun or Changchun or Kungzuling will all be attracted to Chengchiatun when the railway is completed.

Plans Scenic Railway Round Fuji.—Governor Yamawaki of the Yamanashi Prefecture, north of the mountain, wants a railway built around Mt. Fuji, and as his motion was warmly seconded by prominent natives of that prefecture, it has been decided that the suggestion of the governor be at once acted upon and a definite program be drafted.

According to Mr. Ryohei Horiuchi, one of the members of the committee on organization, a brief outline of the plan of improvement for Mt. Fuji is that about seven million tsubo of property owned by the prefecture of Yamanashi are to be let, so that several thousand villas may be built theron to constitute communities of country residences. The most beautiful scenic points at the foot of the mountain are to be selected, as for instance Kawaguchi, Nishi, Shojin, and Honsu. Everything is to be done to make ideal cities. In case residents of these new scenic cities should increase enormously, an automobile service is to established to be run on a road about fifty feet wide.

In order to accommodate general visitors, an electric railway system would be established to run cars between Otsuki and Yoshida and between Yoshida and Honsu so that views of the eight lakes behind Mt. Fuji might be comfortably enjoyed from the cars. The capital of the electric railway enterprise is already tentatively fixed at Y.3,000,000 Only the shareholders of the Electric Railway Company are to be entitled to locate their villas in the scenic utopia.

Japanese Railways Increase Capital.—The Nankai Railway (Osaka-Wakayama Railway) will increase its capital from Y.13,600,000 to Y.19,000,000.

The Kyushu Electric Railway Company will increase its capital from Y.9,900,000 to Y.16,000,000.

Japanese Railways Nationalized.—It is reported that the Yokohama Railway and the Awa Light Railway will be bought by the government for Y.3,870,000 and Y.830,000 respectively. The purchase of the railways was approved in the last session of the Diet.

Tramway Sells Rails at Big Profit.—At an extraordinary general meeting of the Gotemba Tramway Company, which runs from Gotemba station, on the Tokaido line to Yamanashi via Subashiri, the most popular entrance to Mt. Fuji, it was unanimously decided to suspend all parts of the company's service, except inside the town of Gotemba. The company plans to sell the rails and ties from outside the town, and to Kagosaka pass, a distance of 13 miles, as the maintenance cost on this run is very high at present. It is reported that when the company sells the track, it can pay to the shareholders a special dividend of about 500 per cent in the present term.

The American Railway Commission.—The Harbin correspondent of the Peking and Tientsin *Times* wrote under date of Oct. 13: At the station of Harbin are to be seen two private state cars. On inquiring the reason of their always being there, we found that they had been supplied by the Russian Government for the use of the American Commission, traveling to Petrograd and back. There are eight Americans, who have been commissioned by the U. S. Government to make arrangements with regard to the taking over of the Russian railways by America. Among them is Mr Stevens, the president of the Pennsylvanian Railways; the others are all very clever engineers. Each one of these Americans has the appearance of being a very intelligent man, and I have heard several opinions expressed by those who have had conversations with them that better men could not have been chosen to fulfill the mission America has given them. Four of these gentlemen have returned to Petrograd again, as they received word that Russia had decided to agree to the arrangements made with America with regard to the railways. It is not yet decided what is to be done about the Chinese Eastern Railway, although it is rumored that railway is to be taken over by America in January, 1918. Many people are hoping that those arrangements will be made—even the Russians themselves, for the way the trains are being run at present is disgraceful. The Express from Petrograd is very seldom on time; one wouldn't mind waiting half an hour or so, but when it comes in 24, and even 36 hours late, and there is no bed to be obtained in any hotel, it makes one disgusted.

Shanghai Tramways Receipts.—The following is the Traffic Return of the Shanghai Tramways (Foreign Settlement) for the month of September, 1917, and for 9 months ending September 30, 1917, with figures for the corresponding periods last year:

	September, 1917	September, 1916
Gross Receipts ...	$139,030.79	$135,873.16
Loss by currency depreciation	29,304.58	35,821.28
Effective Recepts Mex.	$109,726.21	$100,051.88
Percentage of loss by currency depreciation	22.24	27.90
Car Miles Run ...	327,392	328,464
Passengers carried	6,410,110	6,206,829

	9 Months ended 30th September, 1917	9 Months ended 30th September, 1916
Gross Receipts ...	$1,187,793.45	$1,120,920.89
Loss by currency depreciation ...	262,707.59	295,548.88
Effective Receipts M.	$925,085.86	$825.372.01
Percentage of loss by currency depreciation	23.41	27.98
Car Miles Run ...	3,023,508	2,771,385
Passengers carried	54,028,195	50,059,826

	10 Months ended 31st. October, 1917.	10 Months ended 31st. October, 1916.
Gross Receipts ...	$1,336,645.00	$1.262,343.61
Loss by currency depreciation ...	295,060.43	330,349.39
Effective Receipts	$1,041,584.57	$931,994.22

Percentage of loss by currency depreciation... ...	23.35	27.75
Car Miles Run ...	3,350,532	3,122,475
Passengers carried	60,858,929	56,568,243

MINES

Mining and Ore Refining in Korea.—The Acting British Vice-Consul at Seoul, Mr. P. D. Butler, makes the following observations on the mining industry in Korea as reported in the board of trade Journal:

Hitherto the most important mineral in Korea has been gold, and, indeed, it still remains so, though steadily increasing attention is being devoted by the Government General and by individual Japanese capitalists to other minerals, such, for instance, as copper, iron, anthracite coal, tungsten lead, and mica. The authorities are doing all they can to promote the mineral development of the country and a notable inclination is being shown by Japanese capitalists to invest capital in the mines of this peninsula.

So far the most valuable mineral deposits have been discovered in the northwest of Korea—more especially in the South Heian and Kokai provinces. (Japanese, not Korean, readings of place names are given in the course of these remarks.) With supplies of coal and iron, good access to the sea, and the best labor in Korea (the northern Korean being more virile than his southern fellow countryman), this district will probably become the industrial center of the country. Minerals, however, are found throughout nearly the whole of the country, and a number of promising deposits have recently been discovered in the northeast and south.

Statistics of the value of the mineral production of Korea during 1916 are not obtainable, but by adding the value of exports of gold bullion to that of the exports of mineral products (as given in the Customs returns), the figure of £2,610,029 is obtained, which is probably not far short of the total value. This is an advance of upwards of £1,000,000, as compared with 1915, and it may be confidently asserted that the figures for 1917 will again show an increase.

All the bullion produced goes to the Japanese mint, and, with the exception of gold concentrates (part of which are now shipped to the United States for treatment), and about two fifths of the graphite and tungsten (which, though first shipped to Japan, has hitherto mainly had the United States for its ultimate destination), the whole mineral export at present goes to Japan.

Gold.—During 1916 gold bullion was exported from Korea to the value of £1.560.014, to which must be added the value of exports of gold ore and concentrates, which amounted to £110.972. The value of exports of gold bullion showed an advance of about 30 per cent as compared with 1915, and of 55 per cent as compared with 1914. *Export* figures are given as being more reliable than those showing production, which are based on the returns made by mine owners for purposes of assessment of royalty.

As indicating the preponderating part which foreign-owned mines play in the gold-production of the country, it may be remarked that the value of gold produced by such mines was well over £1,100,000 (exact figures are not obtainable), or not far short of 75 per cent of the total. Of the balance of gold, worth approximately £500,000, remaining after the output of the foreign-owned mines has been deducted, no small proportion must be allotted to the very numerous Korean-owned mines, which are being worked on a small scale all over the country, often with very good results. Nearly all the good mines in Korea were originally discovered by Koreans, who have acquired a decided talent in this direction.

At present there are two exceedingly successful gold mines in Korea. One of these, the oldest established and largest in the country, is situated in the Unsan district of South Heian province, the other mine being in the Suan district of the Kokai province. Two other properties are also very successful, namely the mines at Chiksau in Keiki province and those in the Shojo district of North Heian province. In addition there are a large number of mines which are either being worked on a small scale, or have not yet emerged from the development stage. The share of gold mines under Japanese control in the gold production of Korea is not at present very considerable. The Government General has reserved the right to work all mines found in certain areas in the north and east; none of the mines so dealt with have as yet commenced production, but encouraging prospects of ultimate success are announced.

Coal.—The total production of coal in Korea in 1916 amounted to about 190,000 tons, of which 122,640 tons were exported. The coal found is mainly anthracite, though a considerable amount of lignite is also obtained. The most important coal mines are situated near Heijo (Pyeng-yang) in South Heian province, and these produced 161,766 tons of anthracite in 1916. According to an official report the known reserves of coal in the mines are very large. Another promising mine is that near Anju in South Heian province, which produced 21,204 tons in 1916. There are also seven smaller coal mines being worked by individual Japanese, all in North Kankyo province, which produced in the aggregate not more than 25,000 tons in 1916. A new company has recently been formed to work anthracite mines in South Heian province. These mines are said to contain 3.000.000 tons of anthracite. In addition to the above there are six other places (all but one in South Heian province) where deposits of anthracite are known to exist, but which have not yet been developed.

Iron.—The iron-mining industry in Korea has made great progress during the past two years, and the output of iron ore in 1916 amounted to 245.418 tons. It is noteworthy that the most important coal and iron mines are found in the northwest, with Heijo (Pyeng-yang) as a center. Korean iron mines generally possess very extensive veins, and though the quality of the ore is poor—yielding only about 50 per cent of iron—the width and number of the veins more than compensate for the comparatively low quality of the ore. A Japanese official is reported in the local press as having expressed the opinion that Korean iron will eventually be sufficient to meet Japan's requirements in full. There is little doubt but that this industry has a bright future, and, with improved transport facilities, a very large increase in the output of iron ore may be anticipated.

Copper.—Korea produced about 12,700 tons of copper ore in 1916. The richest and most extensive copper deposits hitherto discovered and worked are situated at Kapsan, in South Kankyo province. Another mine is that situated in the Huchang (Kosho) district in North Heian province, in the extreme north of Korea and within a few miles of the upper waters of the Yalu River. In addition to these two mines a number of smaller deposits are worked by primitive means. Further, the local press has recently announced the discovery of important copper deposits in South Chusei province, in the southern part of the peninsula. Development of these deposits is said to have been commenced with promising results.

Tungsten.—Tungsten deposits, though known to exist, were not worked in Korea before the outbreak of war. Since then, numerous deposits have been discovered all over the country, and about 510 tons were exported in 1916. With one exception, all the tungsten ore found is wolfram. The present production of tungsten is about 50 tons a month. The principal deposits are in Kokai province, near Soctarie, and the owners of the mines state that these contain at least 1,000,000 tons of ore, and probably three times as much. A new concentrating apparatus for the treatment of the ore has been installed at Soctarie.

Graphite.—The export of graphite from Korea to Japan and to other countries in 1916 was 9,871 tons and 6,829 tons respectively, as compared with the relative figures of 6,485 tons and 450 tons in 1915. Crystalline graphite is found in the northeast parts of the peninsula, the most important deposits being at a mine about 50 miles to the northeast of Sensen in the Heian province. Amorphous graphite abounds in the southern portion of the country, the largest mine containing this variety being situated in North Keisho Province. Experts in the Government General are of opinion that there are very large undeveloped deposits of both species of graphite in Korea.

Ore Refineries, etc.—A brief description of existing and projected facilities for treating ore in Korea is given by Mr. Butler. A large refinery, capable of treating 200 tons of ore per day, has been erected at Chinnampo to treat gold, silver, copper, and lead ores. A third furnace now being added will, when working, bring up the daily capacity to 370 tons. The same concern has also erected a large copper smelter at the Kapsan copper mines. This smelter commenced working in January, 1916, and can treat 200 tons a day.

Another company is erecting a large iron foundry at Kenji-ho, at the mouth of the Daido River, near Chinnampo. The enterprise is said to be well capitalized and intended to be conducted on a very large scale; possibly Chinese ores as well as Korean will be dealt with. It is anticipated that this foundry will be completed by 1919. A Kobe firm is planning to erect a mineral sorting house and ore refinery near Seoul to treat gold, silver, copper, and zinc ores, etc. In addition, it is stated that an ore refinery is to be established in South Keisho province to handle the ores from the many new mines in South Korea, whilst, at the other end of the country, a syndicate of local mine owners are arranging to build a refinery at Shingishiu on the Yalu River.

Cheap Electric Power at Fushun.—After a recent visit to the Fushun coal mines, Mr. F Yamamoto, former Minister of Finance, stated that the Fushun Collieries are now capable of putting out 2,500,000 tons of coal per annum, with a program for further extension under contemplation. He forecasted a new development by announcing that this wealth of coal is to be utilized for motor power which is to be supplied at the rate of ½ sen per kilowatt per hour by the water gas producer plant now in course of expansion. In Japan motor power costs 1½ sen, and the low rate is expected to bring about a phenomenal growth of sundry manufacturing and electrical industries at Fushun. Cheap power coupled with cheap steel from the works at Anshan now building are expected to contribute, Mr. Yamamoto said, materially to the future welfare of the Empire.

Philippine Coal Projects.—Reservation of government owned and in the district of Zamboanga, Department of Mindanao and Sulu, and the entire island of Polillo, of the eastern coast of Luzon, from public disposition, is now contemplated by the insular authorities, as the result of a request by the Philippine National Coal Company. The matter has been referred to the attorney-general. The company is capitalized at P3,000,000, of which 51 per cent will be taken by the insular government and the rest disposed of to the public. It has sent expeditionary parties to Zamboanga and Polillo.

Near Zamboanga, on Sibuguey Bay is a deposit which, if properly developed, according to members of the party, may solve the coal problem of the Islands. Samples from Sibuguey and from Polillo Island have been analyzed in Manila, and they have been found of high quality. It is believed that there is a great quantity of coal both in Zamboanga and Polillo, and for this reason it is planned to withdraw those regions from public disposition.

Coal Field of Kwangsi.—An article appearing in the Canton press written by a foreign resident at Liuchow, Kwangsi province, tells of a visit to one of the coal fields of Kwangsi, situated near Sipa, in the Loh-cheng Prefecture. There are many natives in the region engaged in mining the coal from the various shafts and carrying it to the adjoining markets. The coal is of the best quality of anthracite and is being mined in fairly large quantities. No machinery is used,—picks, shovels, and the ordinary carrying baskets being all that is required. However, in spite of primitive methods, the different shafts are yielding on an average of 13,333 pounds per day and affording employment to hundreds of people. Some of the shafts are about 30 feet deep, although at present the smaller pits seem to be producing the best coal and the largest yield. The price of the coal varies according to the place in which it is bought. Coal at the pit's mouth is selling as low as 10 cents per picul (133 pounds), but when delivered at a distance, the carrier adds considerable to the original price. The only hindrance to these mines becoming a paying investment is the lack of shipping facilities and means of export. The Lung River, which is the only navigable waterway in the district, and up which small native craft can ply, only flows, at the nearest point, to within 30 miles of the mines, and as the road over which the coal must be carried is difficult to traverse it makes shipment by this route prohibitive and unfeasible. When the Chuchow-Chinchow Railway is completed, it is proposed to lay a branch line from Liuchow to King-yuan, and when this becomes a reality it will increase shipping facilities and cause some of the districts now barren and unproductive to become centers of wealth.

Seoul Mining Company.—At the Suan and Tulmichung Mines, operated by the Seoul Mining Company during July, 20,200 tons of ore were treated, from which there was recovered Y.170,479. On account of making a test run of low grade surface ore in the Soctarie Mill, the month's output was lower than usual. From 40 tons of high grade Kung Kol ore sent to the smelter, a receipt of Y.16,000 has been received.

Tonkin Cement Production.—The production of cement and hydraulic lime by the factory of the Societe des Ciments Portland Artificiels de l'Indochine at Haiphong during 1916 amounted to 75,697 tons of the former and 3,494 tons of the latter, against 72,000 tons of cement and lime in 1915. The company expected a production of 95,000 tons, but was handicapped by a lack of Europe supervisors, and a delay in securing machinery and supplies necessary for repairs. The foreign and local scales of cement by this factory during the past three years has been as follows:

Destination	1914	1915	1916
To Foreign Countries			
	Tons	*Tons*	*Tons*
Singapore …………	2,453	5,489	18,971
Java………………	6,256	12,328	13,800
Siam ………………	9,707	9,071	7,196
Hongkong…………	3,159	4,061	4,576
Philippines ………	4,536	5,496	4,396
North China ……	5,787	……	……
Other countries …	709	6	……
Total ……………	32,608	36,451	48,939
Indo-China (and Yunnan)			
	Tons	*Tons*	*Tons*
Tonkin and Yunnan	6,706	8,880	11,556
Anam ……………	2,928	7,500	5,914
Cochin China………	13,150	14,148	11,762
Total ……………	22,784	30,528	26,232

IRON AND STEEL

Japan Sentetsu Kabushiki Kaisha.—The Japan Pig Iron Company, with a capitalization of Y.1,500,000, has been organized. Out of 30,000 shares, 1,500 shares were taken by the Tokyo Steel Manufacturing Company and the remainder by the promoters and endorsers.

Japan Enlarging Iron Foundries.—The work of the third period extension of the Government Iron Foundry at Edamitsu, approved in the last session of the Imperial Diet, is being expedited because of the short supply of iron, and thus to relieve the pressing scarcity of iron materials as speedily as possible. The program involves an estimated expenditure of approximately Y.10,000,000, spread over two years. An increase of 120,000 tons of steel and pig-iron a year is planned.

The Government also contemplates the expansion of the Ironworks, Yawata, Kyushu, with a fund of Y.10,000,000. The extension work will be completed in four years. When completed, the works will be able to turn out 120,000 tons of steel and 770,000 tons of pig iron.

Chinlingchen Iron Mine Opened.—The raw materials for the manufacture of steel and pig iron in the Japanese Government works at Edamitsu will be supplied from the Chinlingchen iron mine in Shantung province, lying on the Tsingtao-Tsinan Railway. Last year the War Office started working the mine with an outlay of Y.50,000, appropriated from the emergency expenditure funds, and early this year set about its regular working, with an outlay of Y.500,000. Mr. Oshikawa, Chief of the Government Iron Foundry, is carrying on the negotiations with army authorities for ore from the mine.

United States Steel for Japan.—According to a telegram received locally, says the Manchuria *Daily News*, the pending negotiations about the export of United States iron to Japan are to terminate on the following lines:

1. For the present year, the United States shall supply 100,000 tons of iron material to Japan in consideration of the supply of 150,000 tons of vessels.

2. In 1918, the United States shall supply 150,000 tons of iron material and shall receive in return the supply of 250,000 tons of vessels which are to be constructed with the imported iron.

3. In 1919, the United States shall supply 150,000 tons of iron material to receive in return the supply of 300,000 tons of vessels.

Thus Japan will receive 400,000 tons of iron supply enough for the construction of 500,000 tons of vessels in three years' time and is to furnish to the United States 700,000 tons of vessels.

New Steel Works for Japan.—Arrangements have been made for the establishment of Sino-Japanese ironworks at Fukuoka, Japan, involving a capital of $10,000,000, which, apparently, is the lowest unit recognized by any self-respecting Japanese capitalists. According to the Chinese press, the Chinese party to the agreements, namely the Hanyehping Company, in lieu of providing its share of capital, will contribute 50,000 tons of cast iron per month. The conditions of the arrangement have not yet been made public.

INDUSTRIAL

New Soap Company in Yokohama.—A new soap company was recently established in Yokohama purchasing the Hiranuma Soap Factory, which was established by the late Mr. Samuel Cocking, who died in Yokohama a few years ago. The capital of the new company is Y500,000.

New Chinese Tea Company.—The China Tea Co. (Ltd.) has been organized in Shanghai for the purpose of dealing direct with American tea consumers. This is the first effort of the kind that has been made by a Chinese company, using modern machinery on its tea plantations, to carry on a direct business. The company has five registered brands of tea to offer in quarter, half, and one pound packages, all of which are to be packed in China and distributed in original packages only. The Chinese tea merchants of Shanghai think that they should display greater activities in promoting the sale of Chinese tea, and to that end an advertising campaign featuring the small package is being inaugurated.

Cotton Shortage in China.—With the present run of the P. & O. Lines between China and Bombay once a month with two boats, the import of raw cotton to China has enormously declined so that Chinese cotton yarn mills have started to worry. On this account enterprises have begun negotiation with the Nippon Yusen and Osaka Shosen, although no definite results have yet been ascertained.

The Chinese mills have not escaped the shock from the limitations of the issue of the Council Bill by the British Government. This caused difficulty in importing Indian cotton so that supplies were looked for to Siam and the United States, but owing to the shortage of bottoms, shipments to meet the demand are unobtainable.

Such a situation has caused a decline in the supply of raw cotton stocks, so that many of the mills had to suspend their night operations. In the face of this the forecast of the product of the year was not up to any large amount. This tight condition, and the expectation that the mills of China will consume about 2,000,000 piculs within the year, has stimulated buyers to make maneuvers for the hustling up of prices. A report to a certain firm in Osaka on the 31st stated that with the exception of the larger mills, they are obliged to curtail their operating hours. This state of affairs has made many a cotton dealer in Osaka investigate the circumstances and, if paying, intend to re-ship raw cotton imported from India to China in order to supplement the supply.

Kobe's New Oil Mill.—With a capital of Y.2,000,000 a new firm known as the Toyo Oil and Fat Company has been established in Kobe. The new organization is busy selecting a site and purchasing machinery. The firm expects in the first place to manufacture coconut, peanut, and soya oils gradually extending its business to the output of butter, soap, etc.,—coconuts, to be supplied from a large copra firm in the South Seas. Hence, as no serious changes take place in the quotation of coconut oil, the trade in this line is said to be remunerative.

Japan's Machinery Industry.—Japan's machinery manufacturing industry has made marked strides since the creation of war conditions, especially with the shipbuilding trade. The total number of mills manufacturing with machinery and employing men of 18 years and above was 1,180 of which 230 were incorporated. The number of workmen totalled 298,158 with an aggregate amount of production valued at Y.250,449,770. The above covers only the private concerns. The value or output according to trade may be given as, ship and car building, Y.74,507,745; in machinery construction lines the value of the production totalled Y.49,006,909; in the manufacture of measures, scales, and munitions, Y.11,711,795; in metallurgical lines, such as the manufacture of steel materials, copper wires, etc., Y.69,003.565 and miscellaneous, Y.1,230,051.

Of the 1,180 plants, those which employ 100 men and above number 88, while those employing 500 and above number only 27. There are 230 firms under the company and corporate system only 20 per cent of the total, the aggregate capital of which is given at Y.77,000,000. The shipbuilding yards and railway car manufacturing plants are mostly large concerns; but those engaged in the making of machinery, those turning out electrical, manufacturing, spinning machineries, munitions, and scales, number something over 20 factories, which carry on their operations in a rather large scale. The total amount value of over Y.250,000,000 last year when compared to the Y.2,000,000 of the year before presents quite an increase.

Industrial Enterprises in Chosen.—Two new factories are reported to be projected for Shingishu, Chosen. One is an ore refinery to handle the ores produced in North Heian province, it having been found impracticable to send ores to Chinnampo on account of the lack of suitable transportation facilities in the province. The other factory is to be a branch of the Fuji Paper Mill Company of Japan. It is planned to use as material wood pulp from the Yalu forests. It is estimated that more than 150,000 tons of pulp will be turned out annually.

The Seoul Press, in commenting on the recent increase of commercial companies in Chosen, reports that during the nine months ended February of this year, there have been formed 61 projects for which application has either been made or is about to be made. The total capital involved amounts to $14,609,000, companies capitalized at $5,932,500 having already received the permission of the authorities, and applications for companies with a combined capital of $3,729,000 being now pending. The remainder of the capital is in connection with certain projects in the course of organization but application for which has not yet been filed. The greater number of these companies are devoted to industrial enterprises, followed by commercial, transportation, and mining projects.

Modern Tannery at Hongkong.—There is now at Mongkoksui, in the mainland portion of Hongkong, a modern tannery, which has been organized under Hongkong laws with a capital of $5,000,000 Hongkong currency. The plant is of the latest modern pattern and was constructed under the supervision of a Chinese tannery expert who has served an apprenticeship in the business in Europe and the United States. The machinery has been ordered from France, Great Britain, and the United States in about equal proportions. The plant will have a capacity of 3,000 cowhides and 100,000 sheep and goat skins per week. While there has been some effort to tan the hides and skins available in South China in a Government plant at Canton, the present Hongkong concern is the first properly commercial undertaking of the sort planned upon a comprehensive basis and with practical supervision in southeastern Asia. The imports of leather into Hongkong for local use and for distribution all over this portion of the Far East are large, and shipments of hides and skins abroad are large and are increasing. The Hongkong concern purposes to use China tan bark and other materials so far as possible, indicating that while the Chinese oak's bark is not as rich in tannin as similar barks in Europe and the United States, it can be had at a much lower price. The concern expects to have its plant completed by November.

Japanese Gas Engines.—With a capital of Y.500.000 an engine manufacturing company has been formed. The new establishment will be known as the Tokyo Oil Engine Manufacturing Company, and 8,000 of 10,000 shares have been allotted to the promoters while the remaining 2,000 were put on the market for public subscription.

Factories in Osaka.—The compilations of the Osaka Municipality show that the factories employing 50 and over workmen in that city were at the end of May numbered at 14,105, which is an increase of 123 over the preceding month, 1,486 over the corresponding period of the previous year. The number of labor hands in May was 162,217, an increase of 695 over the foregoing month, and 11,828 more than the same space of 1916. The following is the list of the number of factories and labor hands during the month of May in the various kinds of industries, as compared to the corresponding period of the previous year:

	No. of Fac. in May	Increase Over May, '16
Dyeing and Weaving ...	1,951	288
Machinery	840	130
Ship and Car Building ...	57	7
Metallurgical	4,141	363
Chemical	1,025	99
Kiln	1,064	108
Combustibles	56	—
Hides and Leather	99	11
Comestibles	3,005	231
Miscellaneous	1,846	249
Special	23	—
Total	14,105	1,486

	No. of Workmen May, '17	Compar. with May, '16
Dyeing and Weaving ...	78,827	+ 3,830
Machinery	9,157	+ 1,143
Ship and Car Building ...	4,179	— 34
Metallurgical	21,180	+ 2,596
Chemical	9,499	+ 868
Kiln	10,730	+ 1,059
Combustibles	3,184	— 142
Hides and Leather	1,450	+ 186
Comestibles	8,101	+ 969
Miscellaneous	14,907	+ 1,387
Special	1,003	— 32
Total	162,217	11,828

A general increase is witnessed in the number of factories and laborers, but a decline was seen in those of shipbuilding, combustibles, and special industries. The decrease in the number of workmen in the above line was owing to lack of materials in the former industry. In the latter, the slackness of overseas trade has obliged the plants to suspend a portion of its works. However, a general rate of 10 per cent increase was seen in the number of factories, and in 7.5 per cent in the number of labor hands, which are enough to prove the expanding tendency of the Osaka industrial circles.

CHEMICALS

Japanese Bleaching Powder.—The Japanese production of bleaching powder, according to press statements, amounts to about 2,000 tons a month, or between 24,000 and 25,000 tons a year. The Japan *Chronicle* reports that ordinarily 70 per cent is for the domestic market and 30 per cent for export, but that of late the domestic demand has considerably increased with the development of paper manufacturing and other industries, and that a great increase is also shown in the foreign demand on account of the suspension of British and German supplies. According to the official Japanese reports, exports of bleaching powder amounted to about 2,200 tons in 1915, 850 tons in 1914, and 1,100 tons in 1913. Orders are principally from China, India, and the South Seas, but the export trade is greatly interfered with by shipping conditions. There are also increased demands from Sweden and Norway, and the demand is considerably in excess of the supply, according to the *Chronicle*. Before the war, quotations stood at about $1.50 per 100 pounds. In January and February of last year quotations rose as high as $14, but dropped to about $4.25 in July and August. At present, prices range from $5 to $6 per 100 pounds, or about $112 per ton. When the necessary tonnage is available there will be very bright prospects for exports of bleaching powder from this country. Manufacturers accordingly are projecting extensions of equipment.

Japanese Glycerin.—This industry has attained remarkable development since the outbreak of the war. The Government is now granting pecuniary aid to those engaged in this particular line of industry, and the result has been the establishment of the Japan Glycerin Manufacturing Co. and several other concerns. Before the war none of these companies existed, and consumers in Japan relied entirely upon imports from the United States and other countries. The output of the Japan Glycerin Manufacturing Co. alone amounts to 300 tons a month, and in the course of the next few years the imports of this commodity will, it is believed, be nearly checked.

Yellow and Red Phosphorus in Japan.—The supply of yellow and red phosphorus was, prior to the war, obtained from markets abroad, but with the establishments of chemical companies since the outbreak of the war, keen study has been made, which has resulted in the successful experimentation in the materials. At present, the article is produced from the laboratories of the Japan Chemical Industry, Fuji Chemical, Toyo Electrolytic Chemical Companies, etc. The average output of the companies amounts to about 100 pounds monthly, which rate easily satisfies the annual demand of 3,000 tons during peace times. With the increase of the national output, the price has also taken a proportionate fall; at one time the quotation per case was Y.600, but to-day it is about Y.120 to Y.130 which is rather hard on the manufacturers, and it is reported that they have petitioned the authorities for permission to export the article, in order to ameliorate the sufferings caused by the fall in prices. The Department of Agriculture and Commerce, realizing their claim, have allowed the export of both articles with the limitation that each company can send no more than 3,000 pounds of yellow and 5,000 pounds of red at one shipment. This has brought about a large export to China and Russia, so that a slight readjustment of prices has come about. The question before the manufacturers at present is that of demand and supply after the war. It is supposed that imports of the materials may be checked if raw materials, that is, phosphoric ores from the South Seas, are obtainable. Then through the electric process and cheap labor of Japan no difficulty will arise to supply the nation with the necessary domestic output.

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Gaston, Williams & Wigmore.
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Concrete Reinforcement
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Gaston, Williams & Wigmore.
Niles-Bement-Pond Co.
Shewan, Tomes and Co.
U. S. Steel Products Co.

Condensing Plants
Andersen, Meyer & Co., Ltd.
Worthington Pump Co., Ltd.

Contractors, Electrical
Andersen, Meyer & Co., Ltd.
Gaston, Williams & Wigmore E.E. Corp.
Shanghai Dock & Engineering Co., Ltd.
Shewan Tomes & Co.

Contractors, (General)
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White & Co. Inc., J. G.

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Gaston, Williams & Wigmore.
Niles-Bement-Pond Co.

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Gaston, Williams & Wigmore.
Niles-Bement-Pond Co.
White & Co., Inc. J. G.

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Babcock & Wilcox, Ltd.
Gaston, Williams & Wigmore.
Niles-Bement-Pond Co.

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Andersen, Meyer & Co., Ltd.
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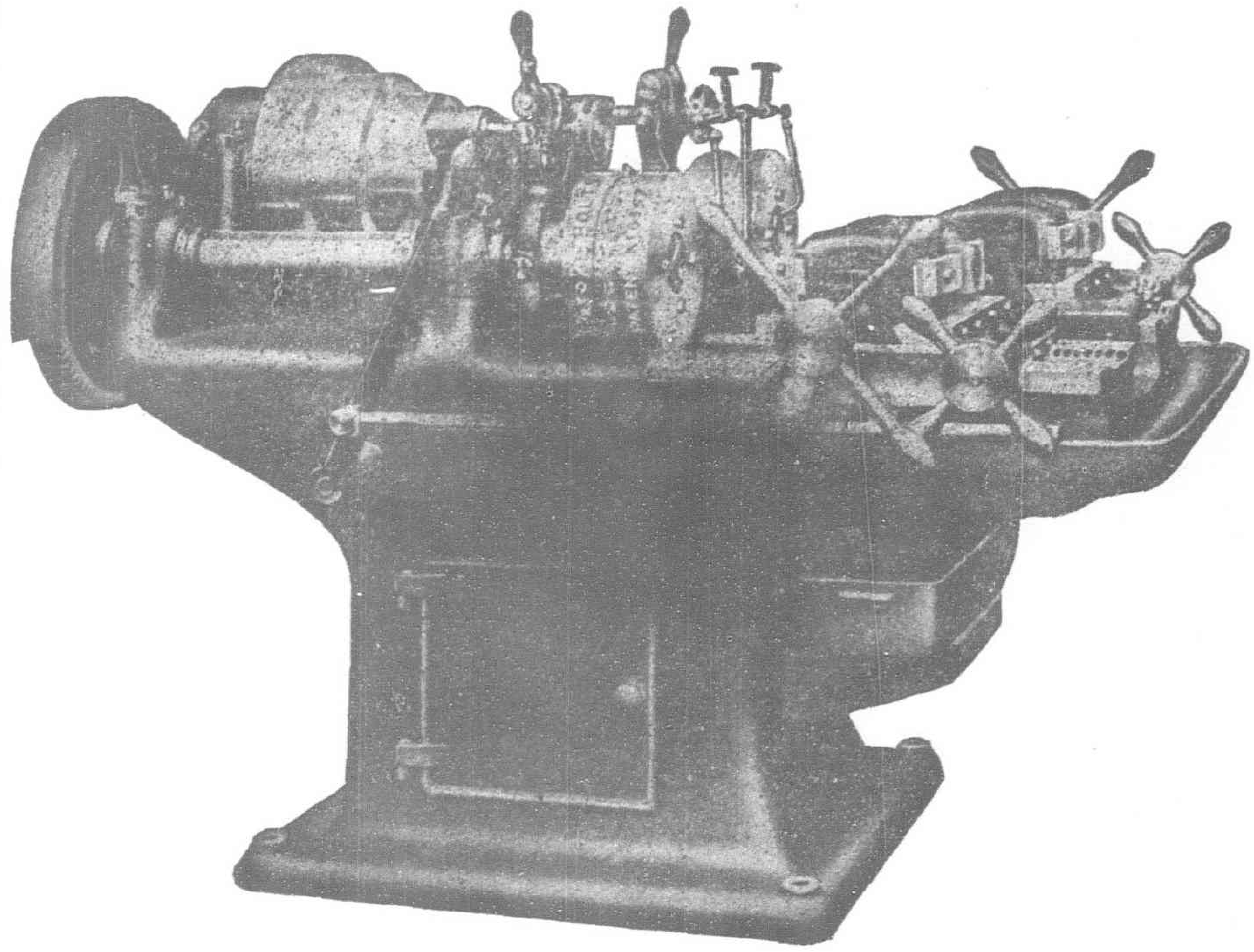
(Continued on Page 59)

Automatic, Double Head Bolt Screwing & Nut Tapping Machine



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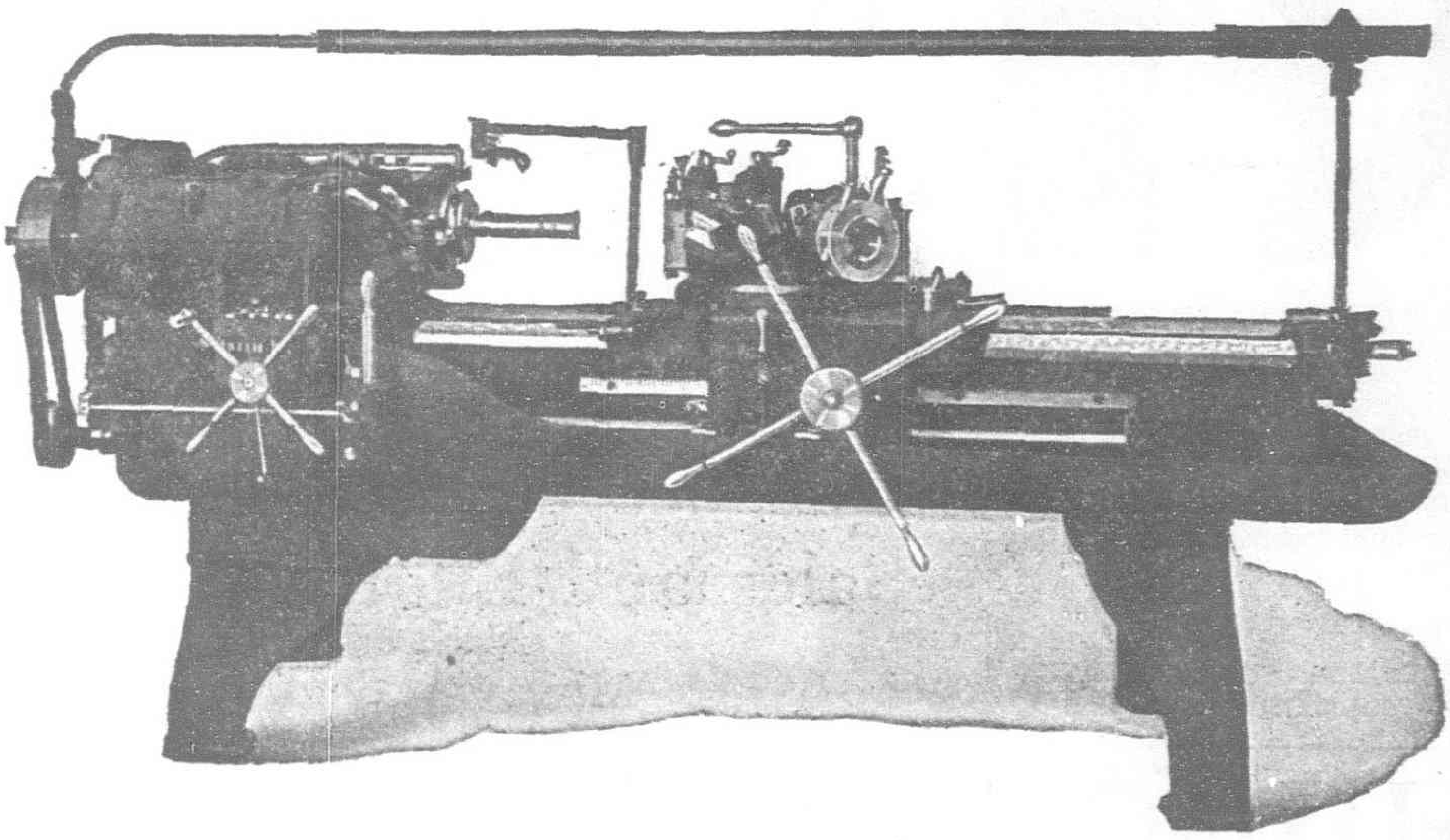

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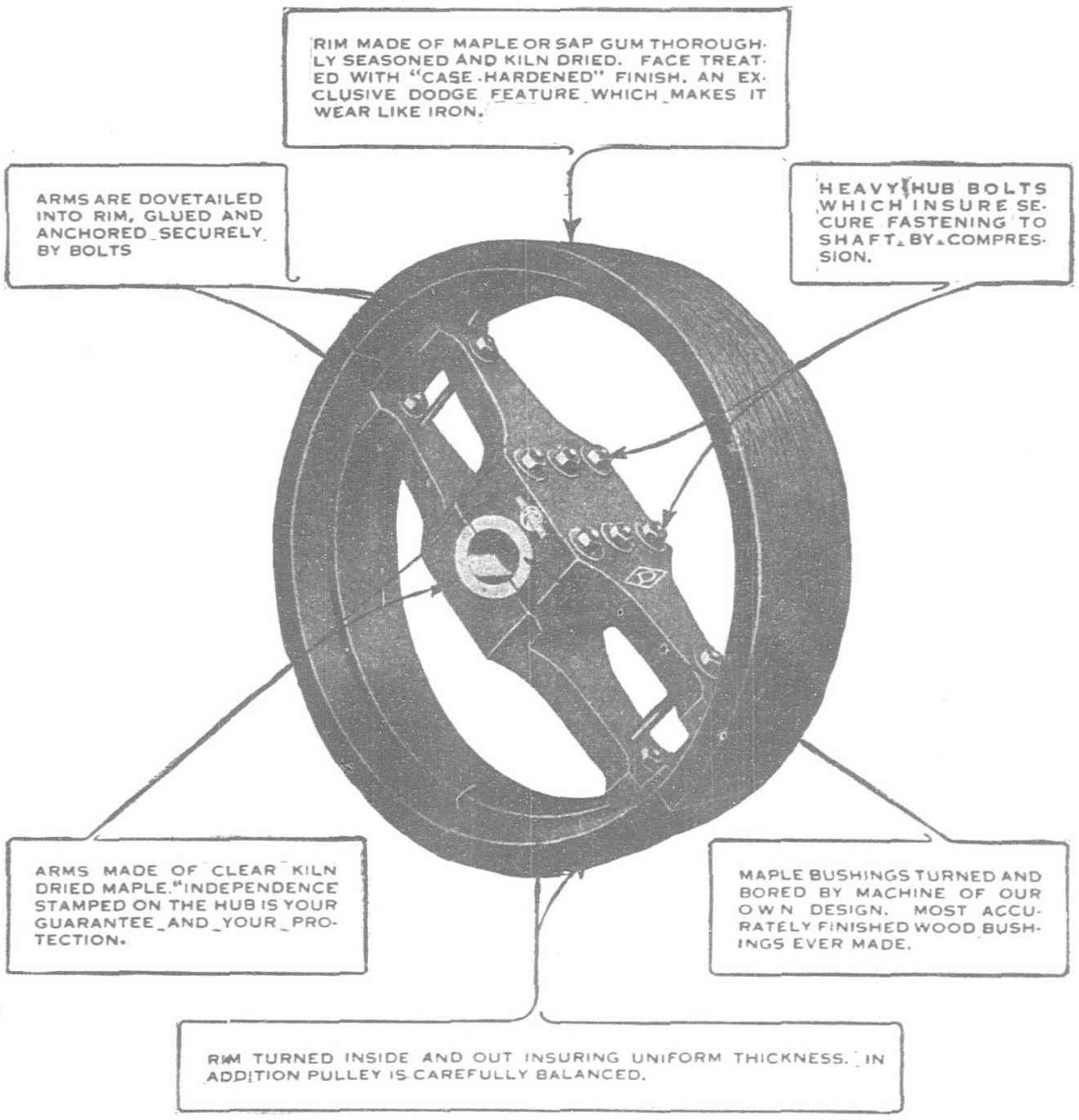

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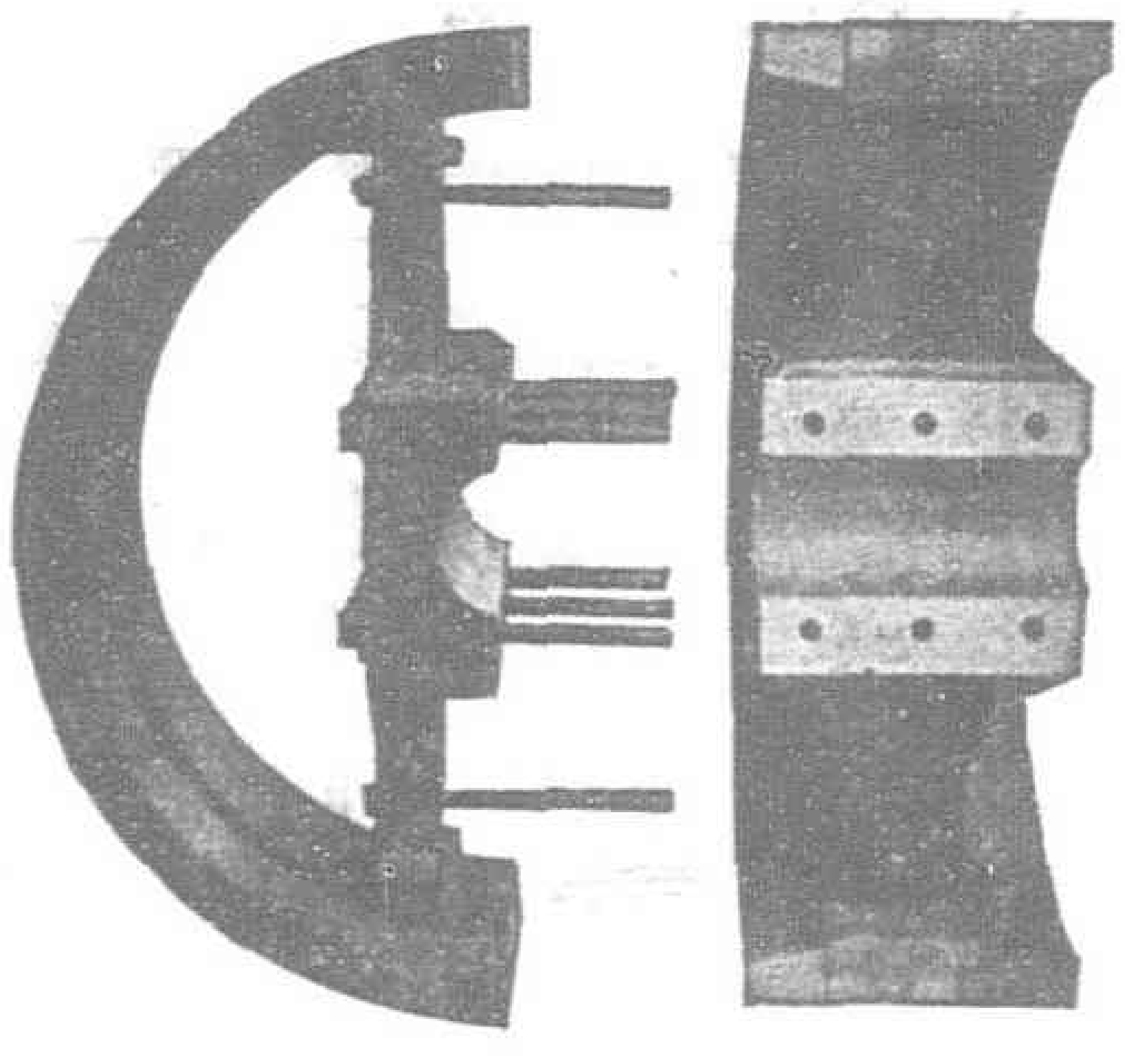

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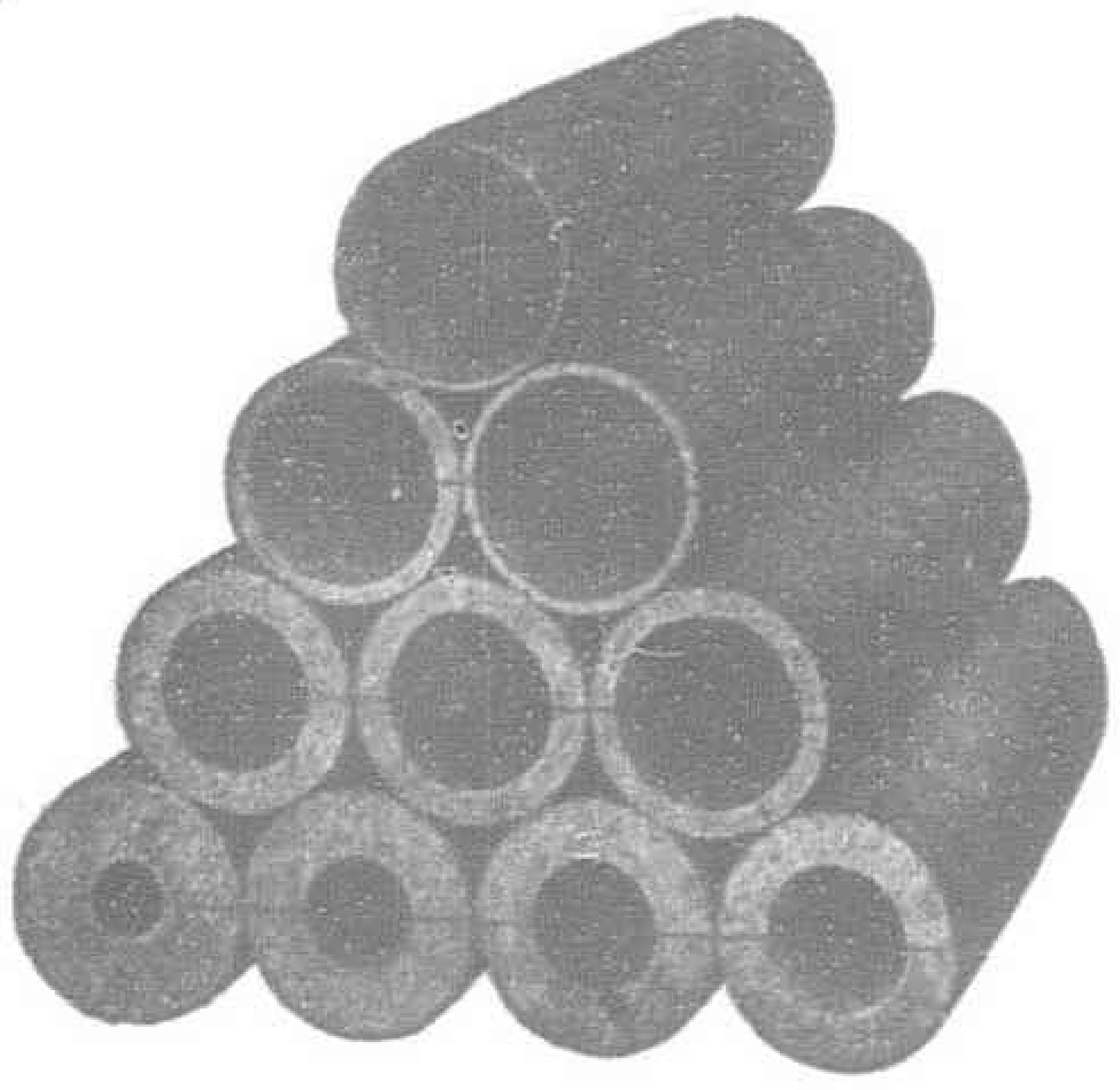

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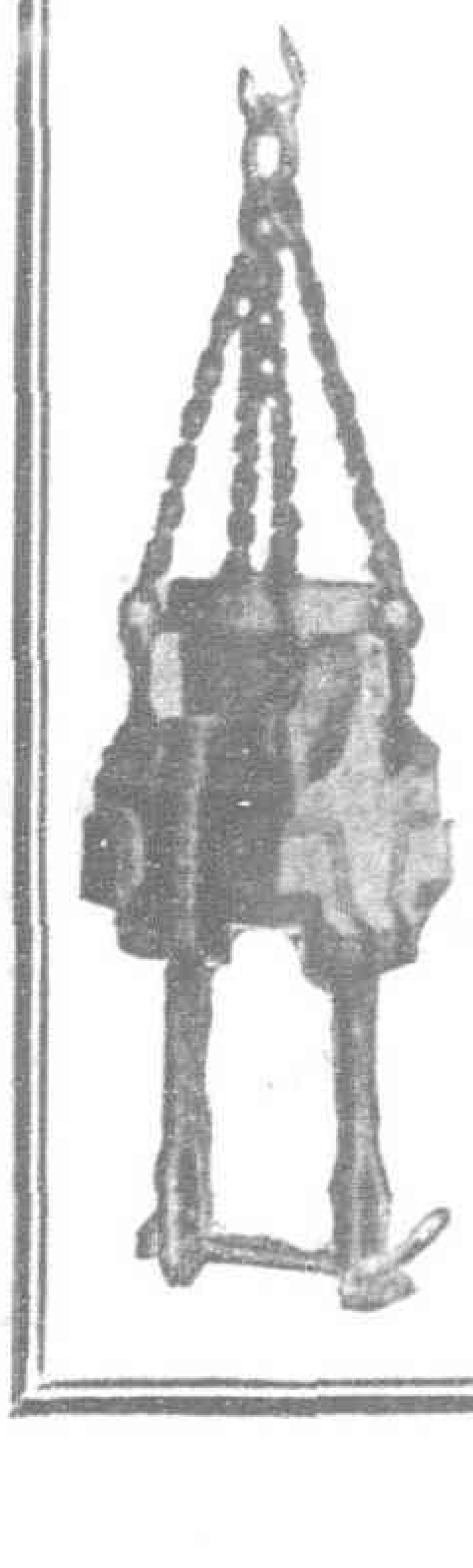

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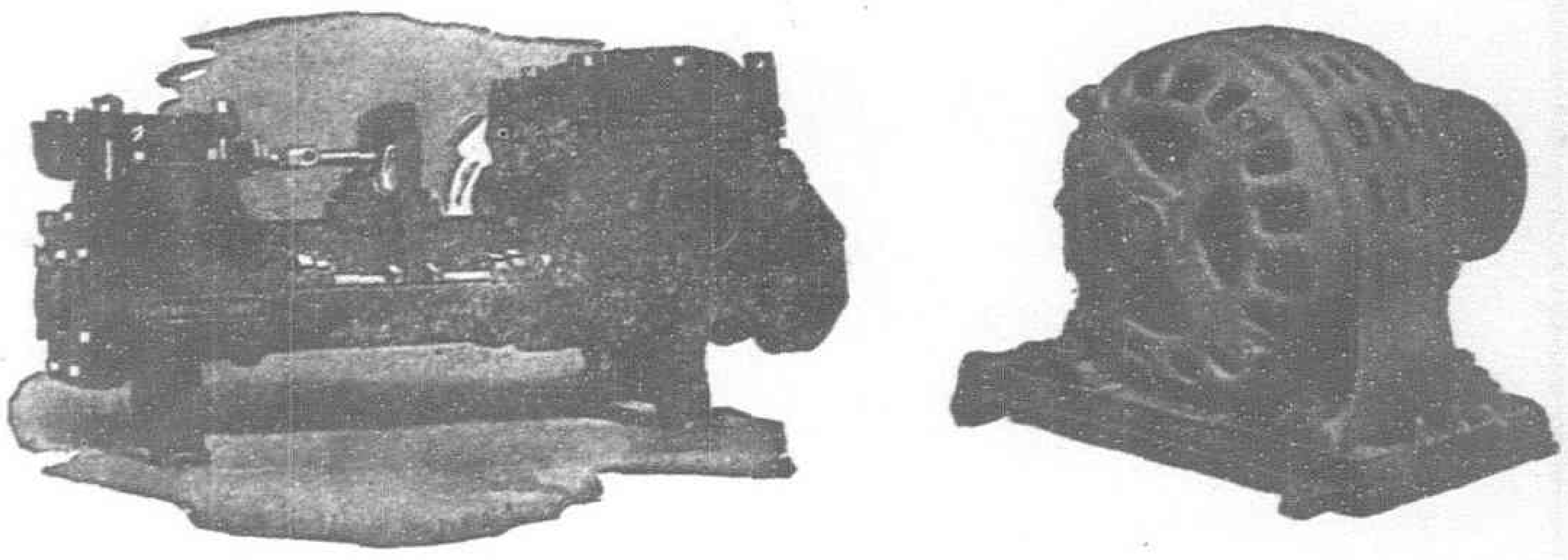

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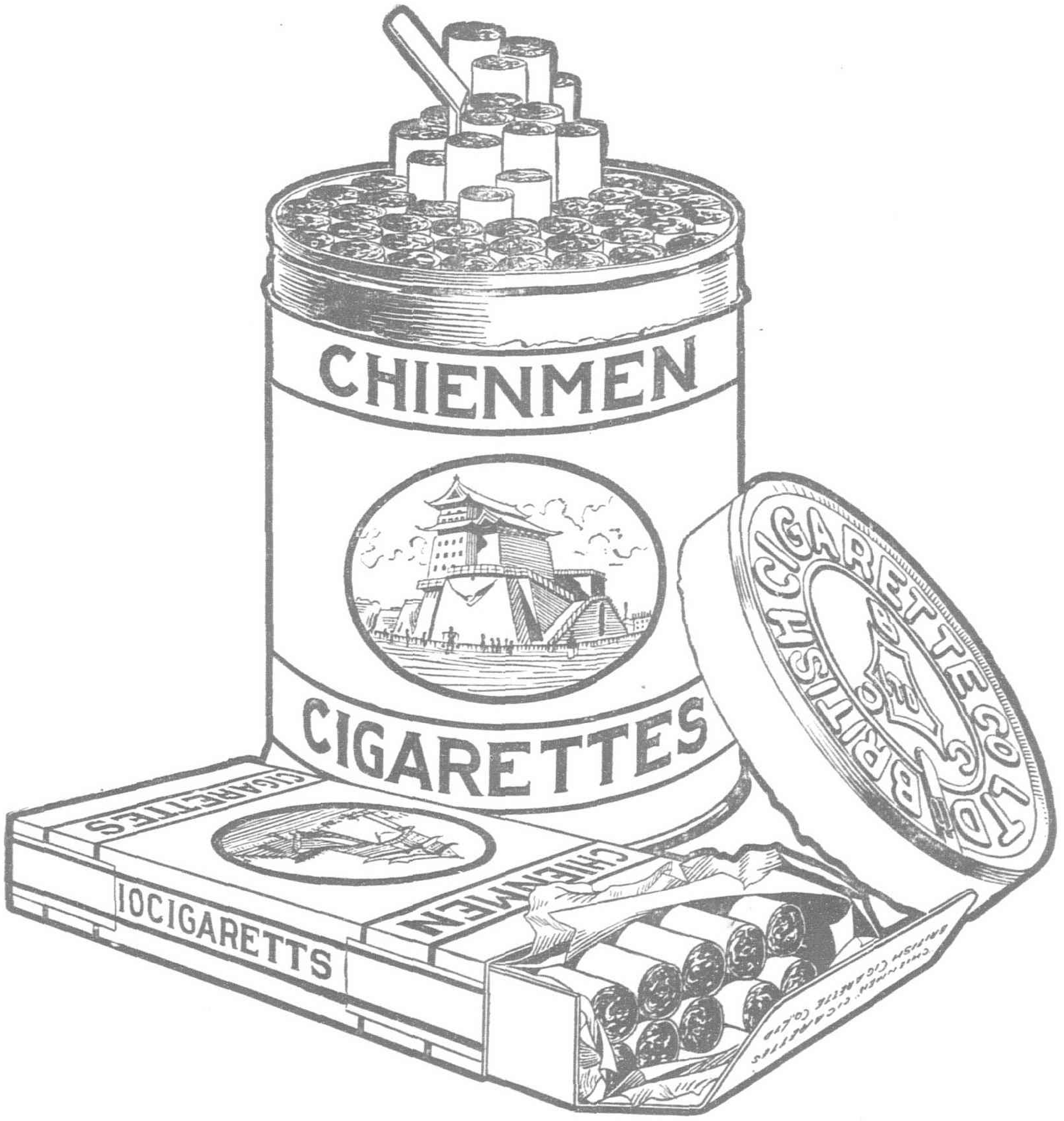

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FOURTH SHORT-TERM LOAN

Notice

The Ministry of Communications has been petitioned to raise on behalf of the Peking-Suiyuan Line a Short-Term Loan for the amount of silver dollars one million ($1,000,000) Peking local currency, for the purpose of further developing the interests of the Railway.

The following regulations governing the bonds of this Short-Term Loan are hereby published for information of the public. Holders of the bonds of the THIRD SHORT-TERM LOAN of the Suiyuan Line are requested to pay special attention to Article 11 of these regulations:—

1.—This Short-Term Loan to be used for the purpose of developing the interests of the Peking-Suiyuan Line is entitled the Fourth Short-Term Loan of the Peking-Suiyuan Line.

2.—The total amount of this Short-Term Loan is silver dollars one million ($1,000,000) Peking local currency.

3.—The bonds issued for this loan are of four denominations, viz.:—Bond of $1,000, bond of $500, bond of $100, and bond of $50. Such bonds are numbered consecutively with no names of holders.

4.—The term of this loan is for one year, and shall be repaid in silver dollars at the end of 12th month of the 7th year of the Republic.

5.—The rate of interest is at 7½% (seven and one half per mille) per mensum, and to be paid in silver dollars by two installments, viz.;—1st installment—from 1st day of 1st month to 30th day of 6th month, 2d installment—from 1st day of 7th month to 31st day of 12th month of the 7th year of the Republic.

6.—The interest at 7½% (seven and one half per mille) per mensum, calculating from the 2d day following the payment of principal up to the 31st day of 12th month of the 6th year of the Republic shall be paid in advance when the principal is paid.

7.—The amount for the repayment of this loan shall be appropriated from the operating revenues of the Peking-Suiyuan Line and deposited monthly in the Bank of China, Bank of Communications, and Hsin Hua Bank, Peking, for the repayment of principal and interest accrued thereon. If the amount so deposited is insufficient, the Ministry of Communications shall be held responsible for the full repayment of the loan.

8.—The bonds of this loan can be accepted as silver dollars in payment for freight of the Peking-Suiyuan Line.

9.—These bonds can be used as security by the officers of the Government Railways as well as by those transportation companies and contractors.

10.—Payment of this loan shall be made in the following places:—Ministry of Communications, Peking-Suiyuan Railway Office, Peking; Bank of China and Bank of Communications, Tientsin, Shanghai, Hankow, and Kalgan; and Hsin Hua Bank, Peking and Tientsin. Repayment of principal and interest shall also be made by the above-mentioned banks on behalf of the Peking-Suiyuan Line.

11.—Loan subscription commences from 1st day of 10th month to the 30th day of 11th month of the 6th year of the Republic. Intending subscribers must make payment for the bonds within the said period. Holders of the bonds of the Third Short-Term Loan of the Peking-Suiyuan Line can, if they so desire, present such bonds to the Peking-Suiyuan Railway office for examination, and exchange for the bonds of the Fourth Short-Term Loan when interest due thereto will be paid up by the Railway.

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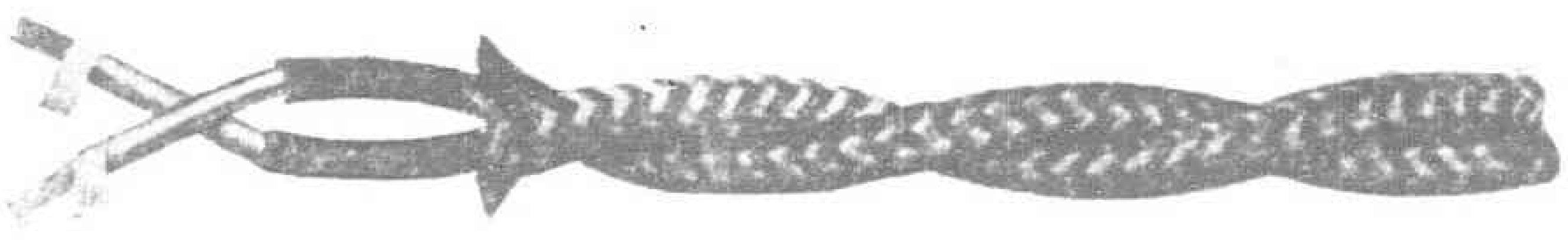

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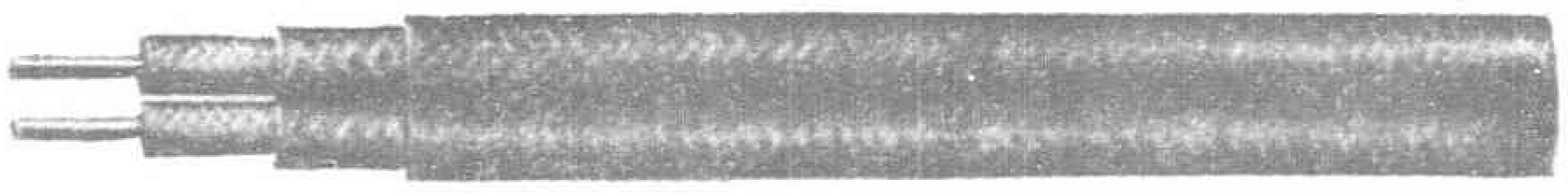

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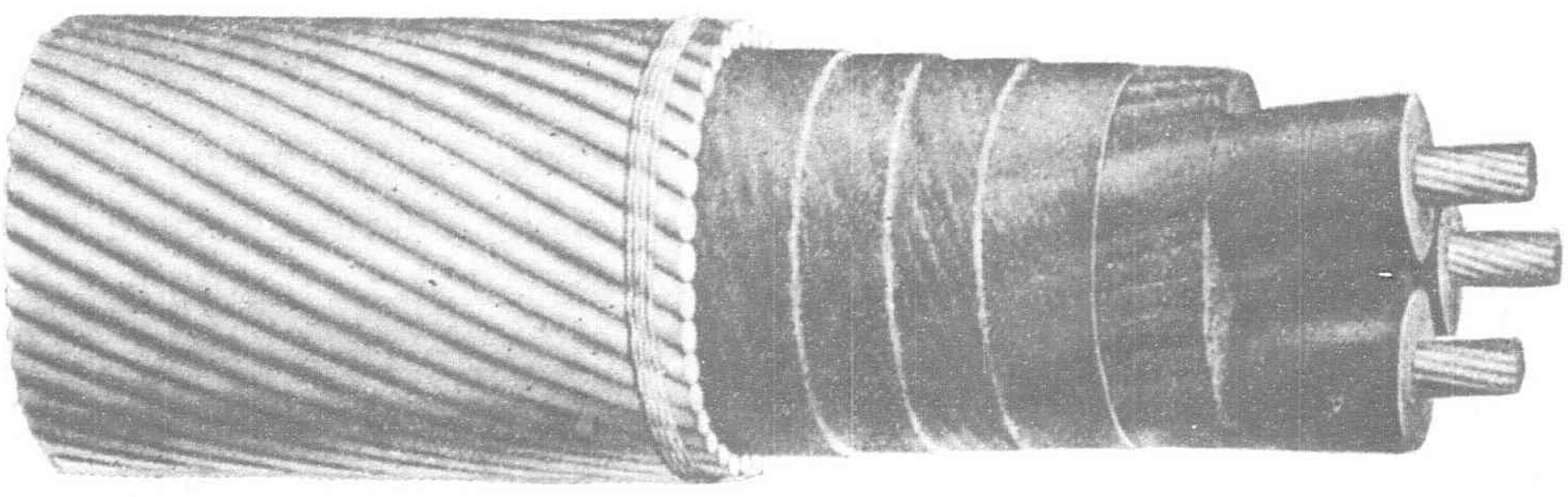

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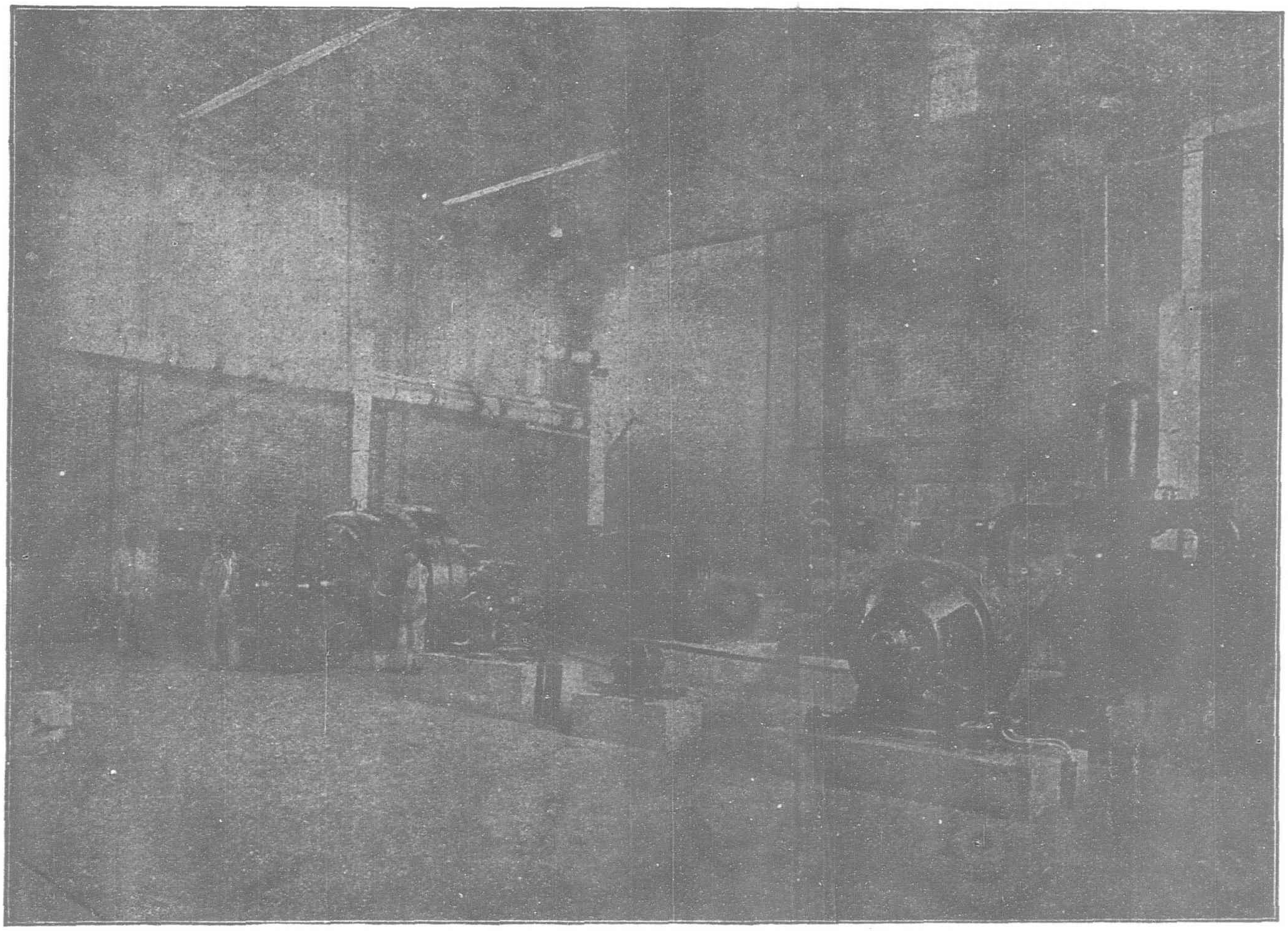

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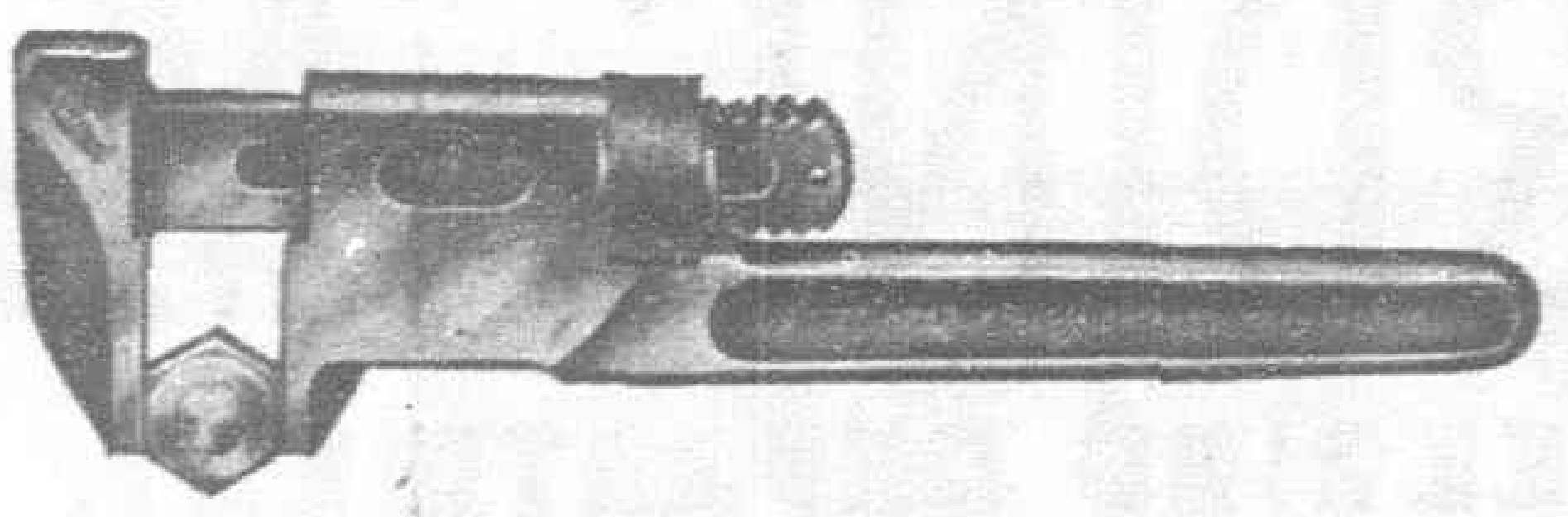

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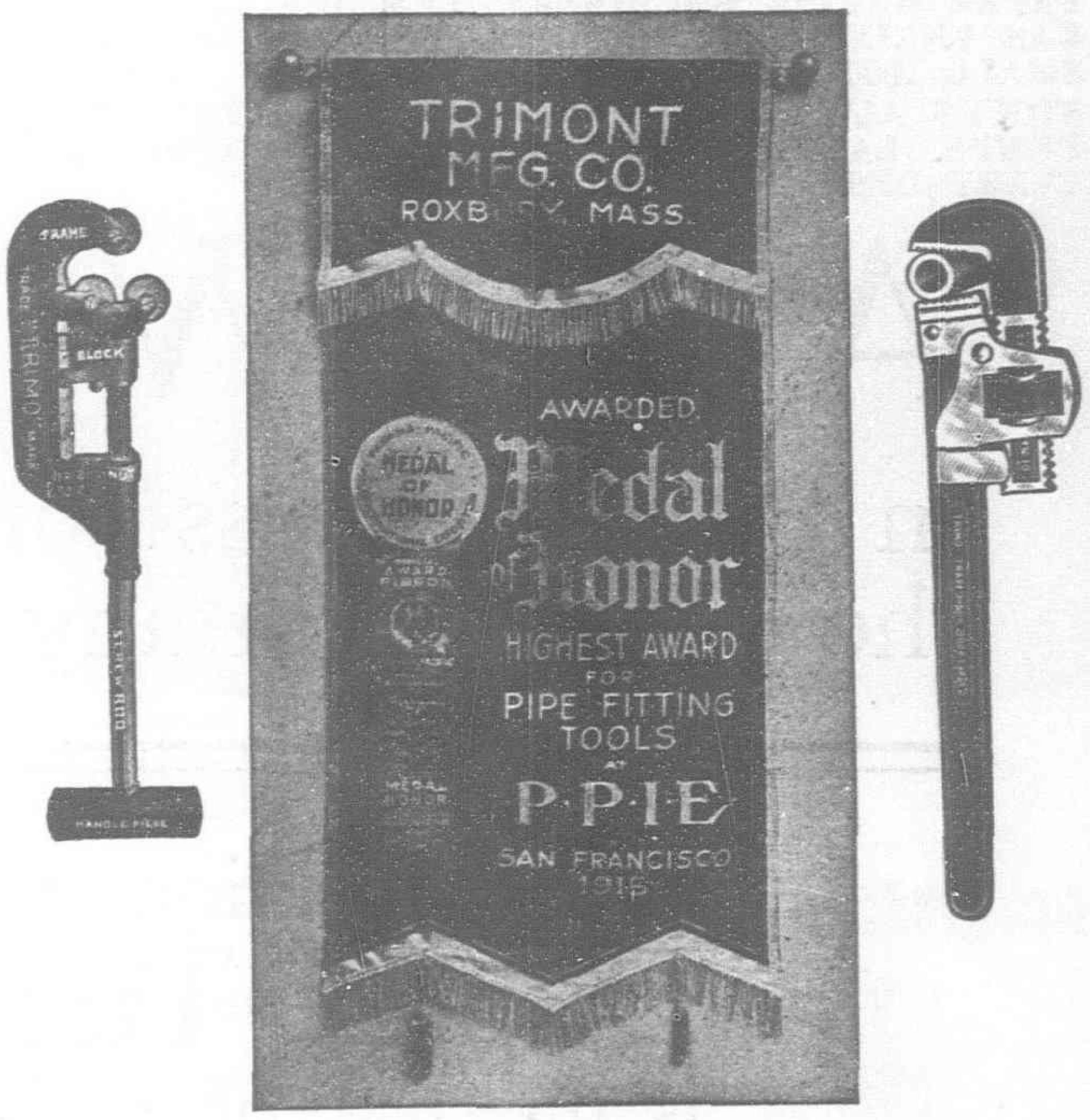
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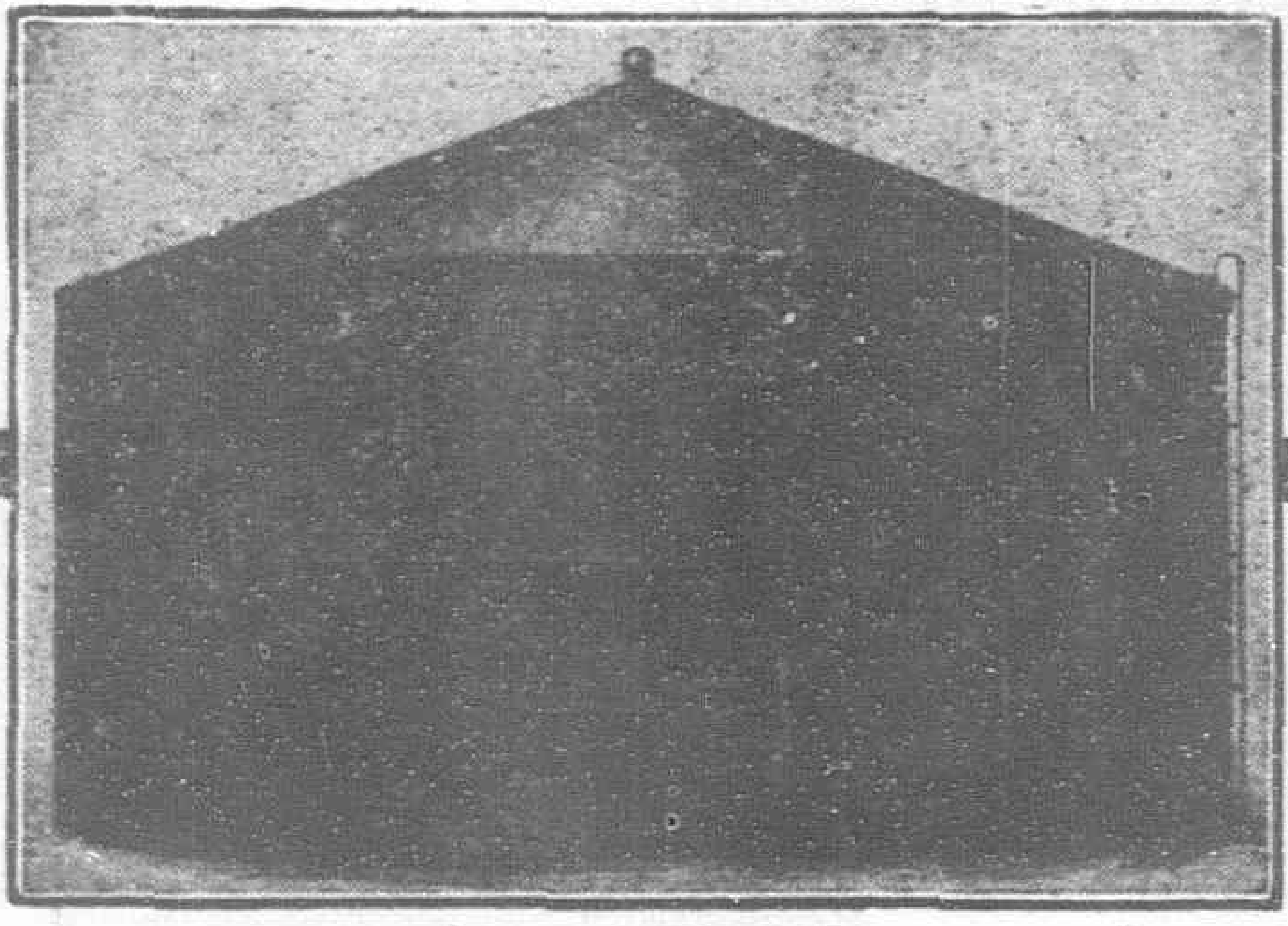

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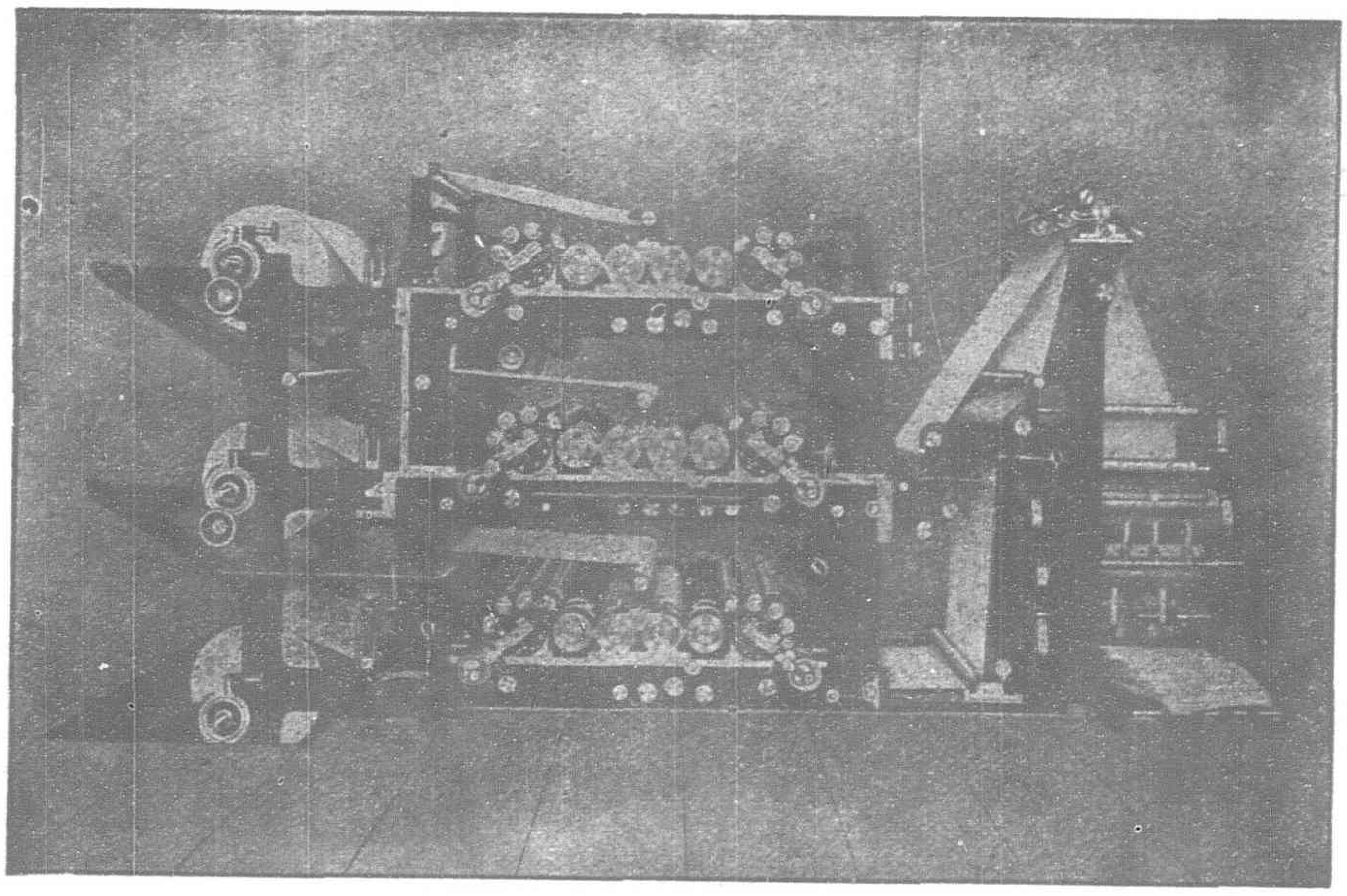

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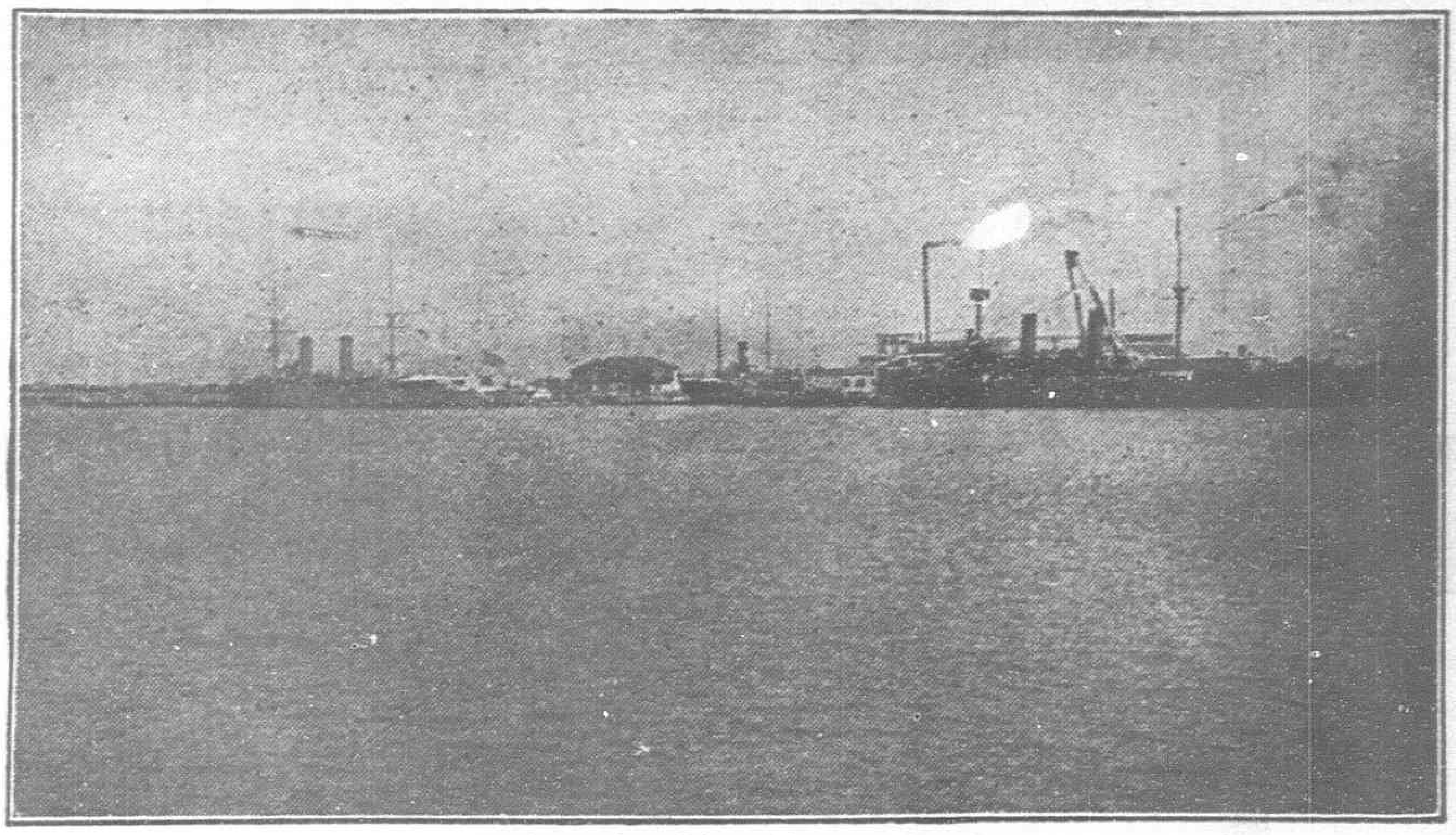

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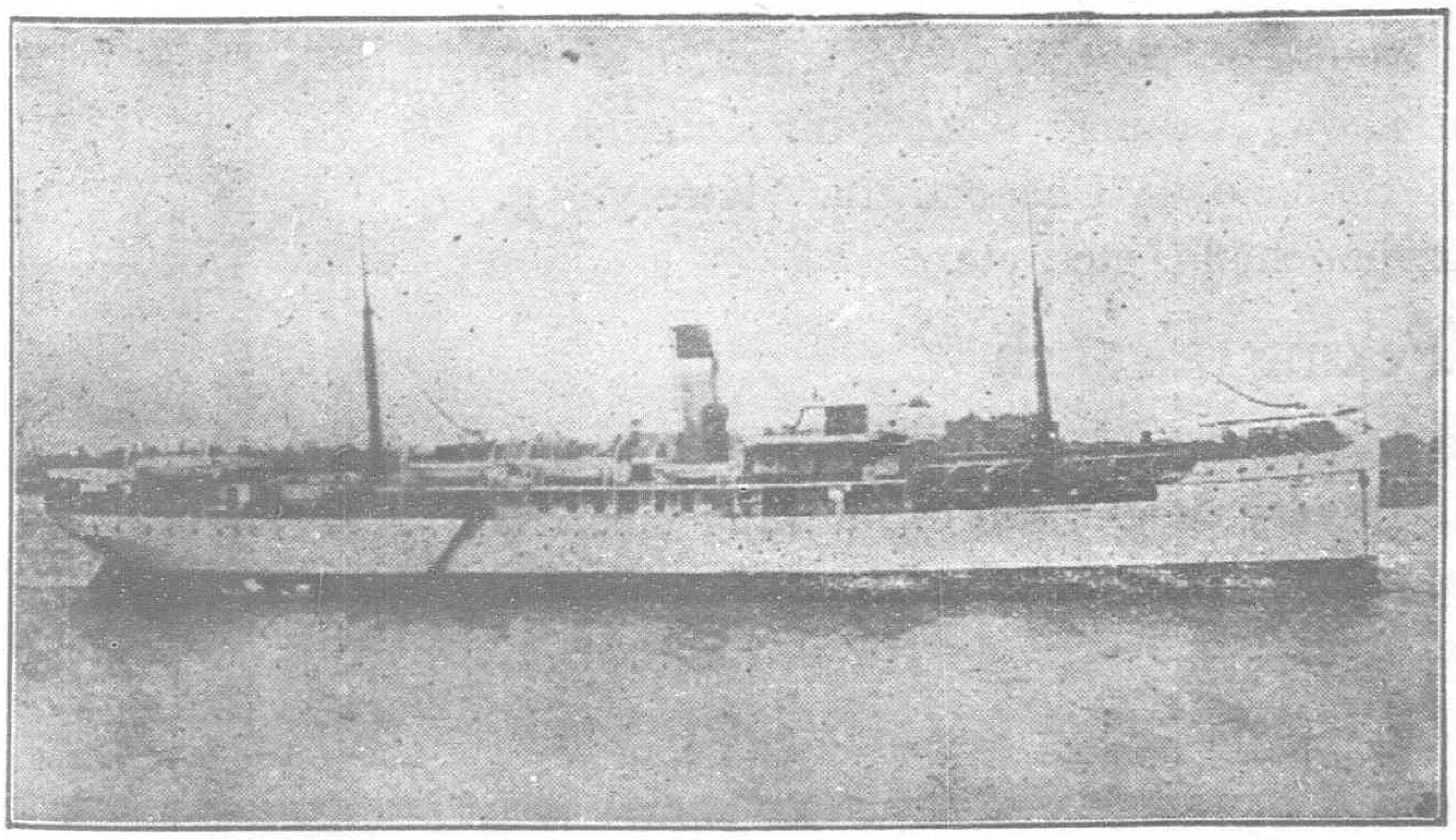

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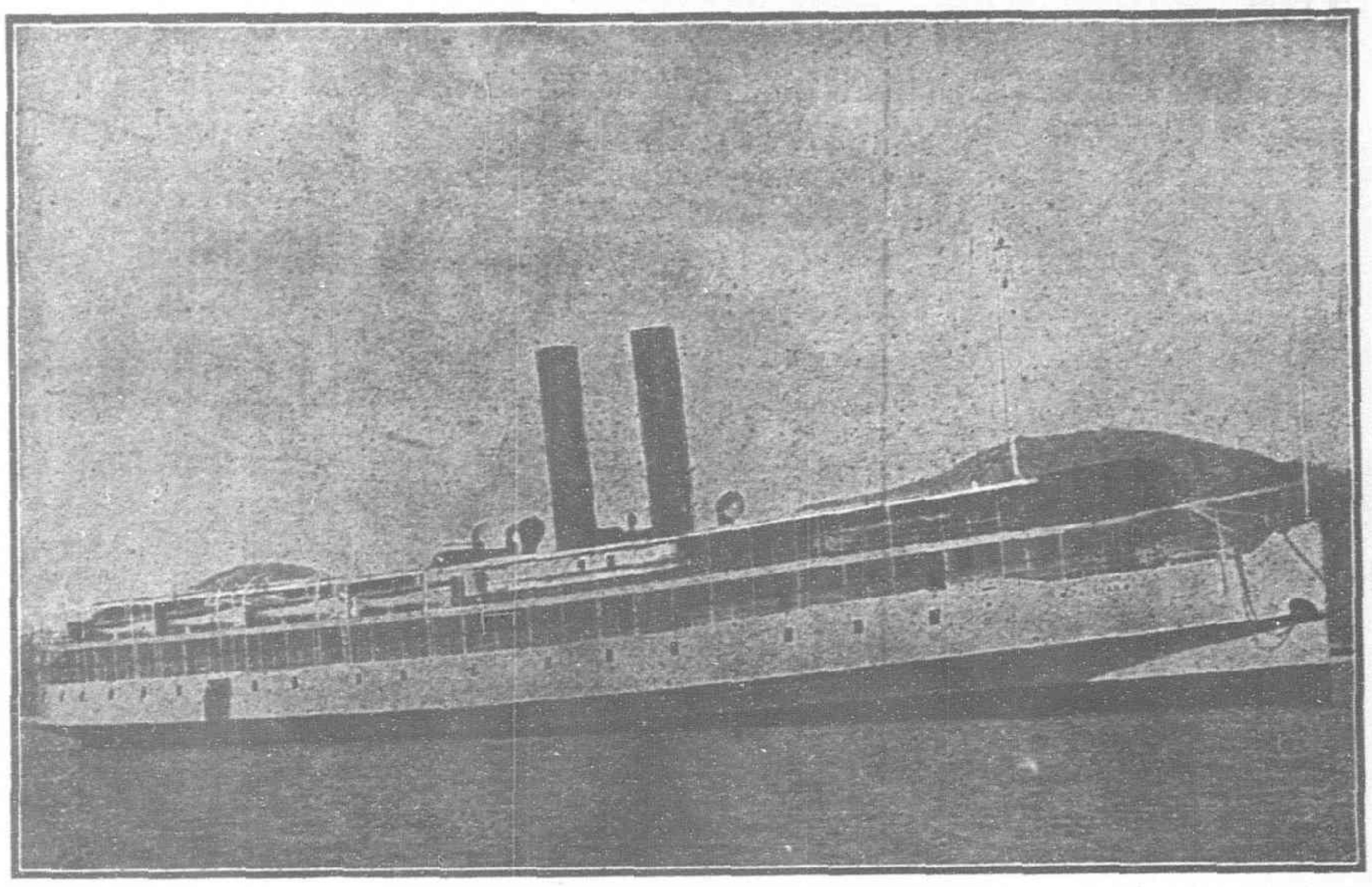

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No. 1 Dock, Kowloon . . .	700	86 ft. top 70 ft. bottom	30′	7′ 6″	3
No. 2 Dock, Kowloon . . .	371	74′	18′ 6″	7′ 6″	——
No. 3 Dock, Kowloon . . .	264	49′ 3″	14′	7′ 6″	——
Patent Slip, No. 1, Kowloon .	240	60′	14′	7′ 6″	——
Patent Slip, No. 2, Kowloon .	220	60′	12′	7′ 6″	——
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Cosmopolitan Dock	466	85′ 6″	20′	7′ 6″	——
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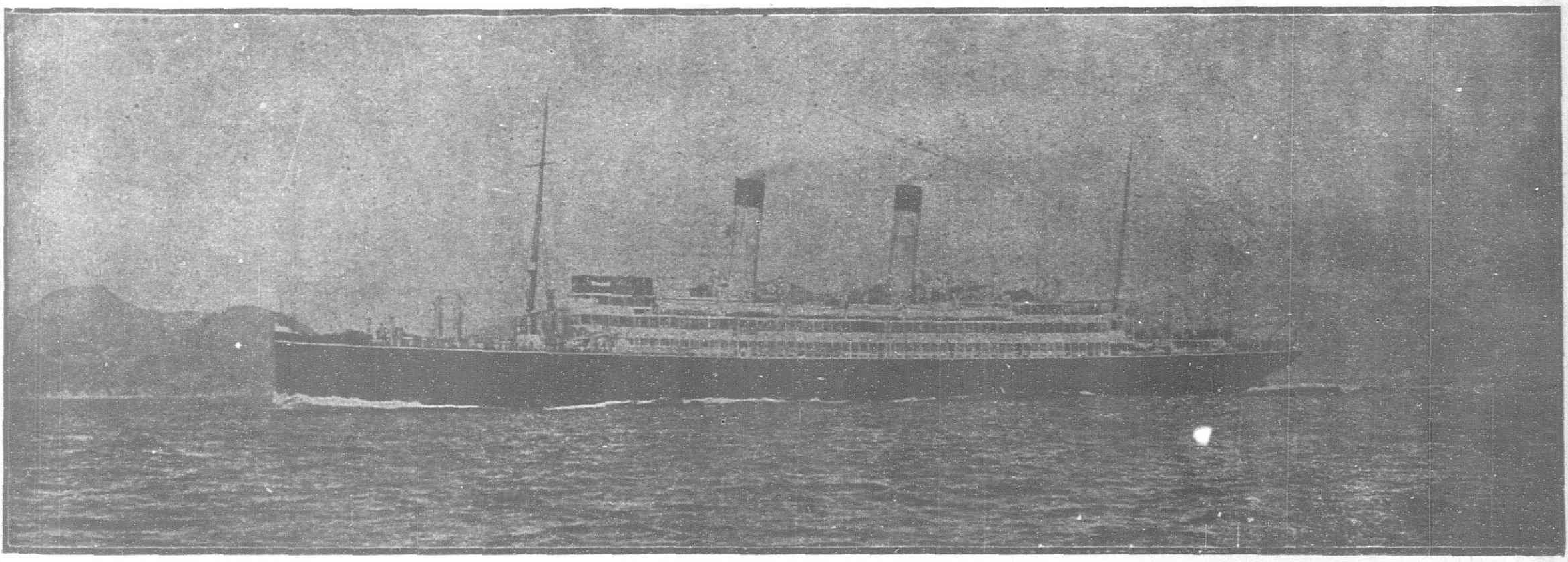

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Length on Blocks	513	„
Width of Entrance on top . .	88	„
„ „ „ „ Bottom	77	„
Water on Blocks at Spring Tide	23½	„

DOCK No. 2.

Extreme Length	371	Ft.
Length on Blocks.	360	„
Width of Entrance on top . .	66	„
„ „ „ „ Bottom.	53	„
Water on Blocks at Spring Tide	22	„

DOCK No. 3.

Extreme Length	722	Ft.
Length on Blocks	714	„
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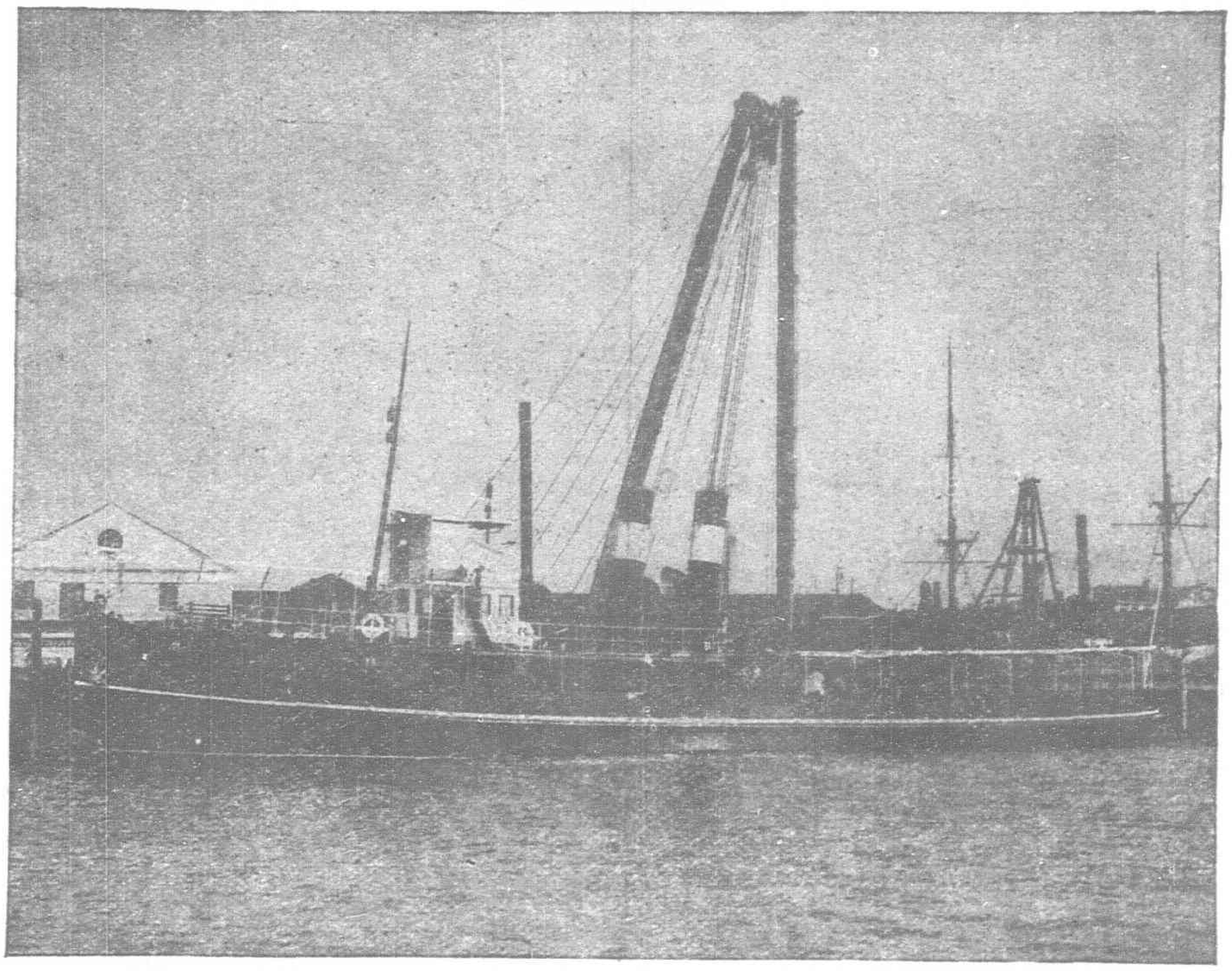

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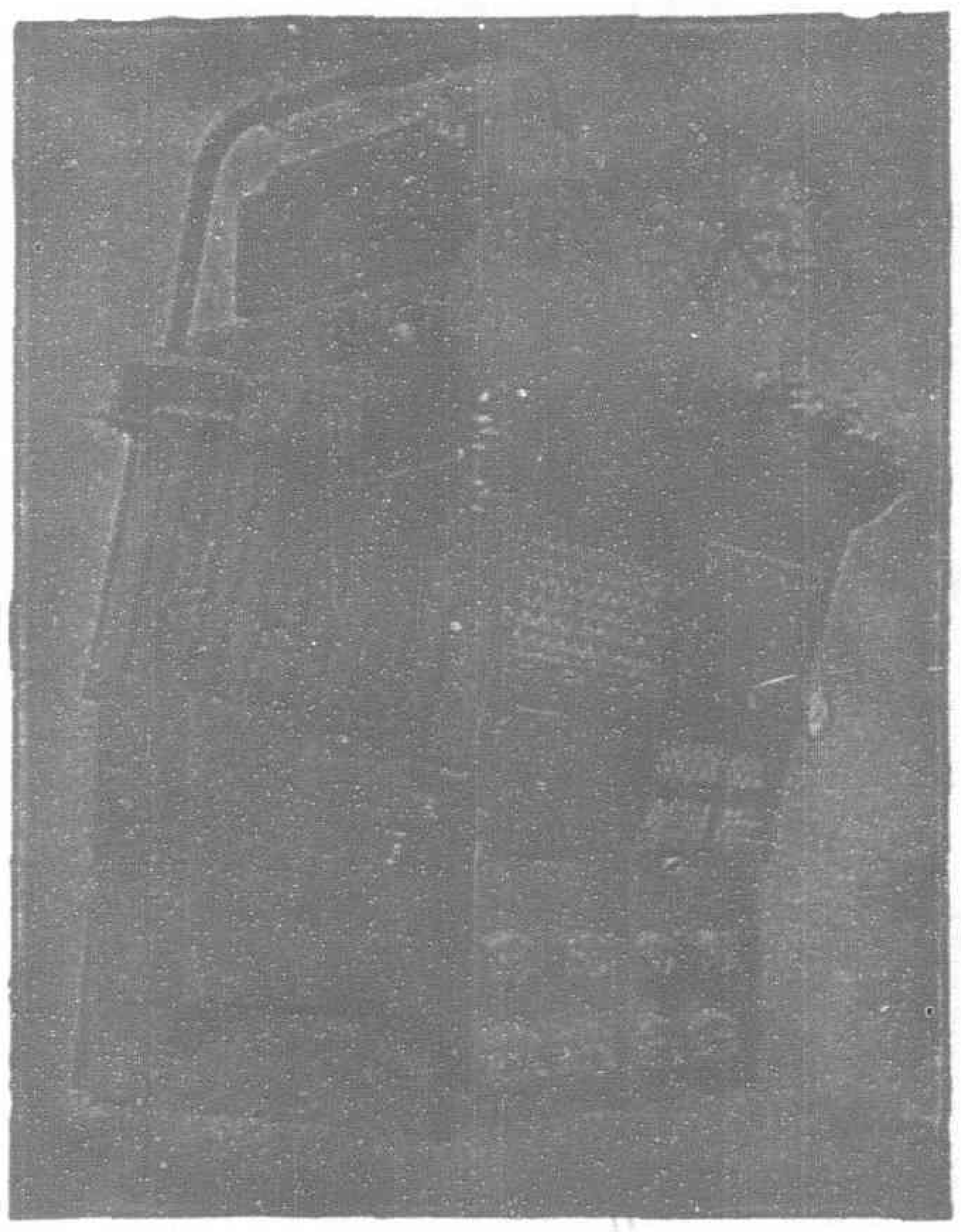

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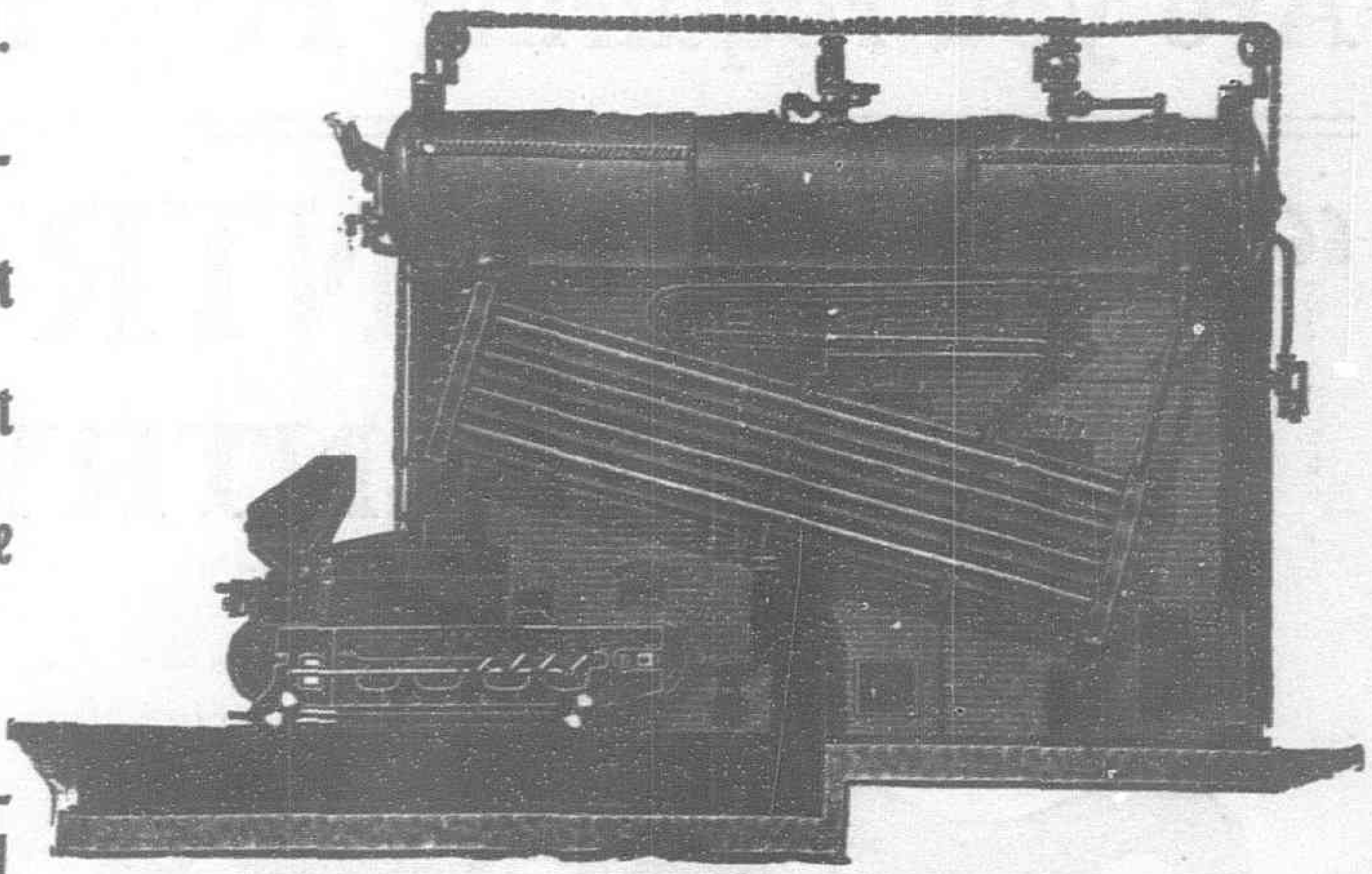

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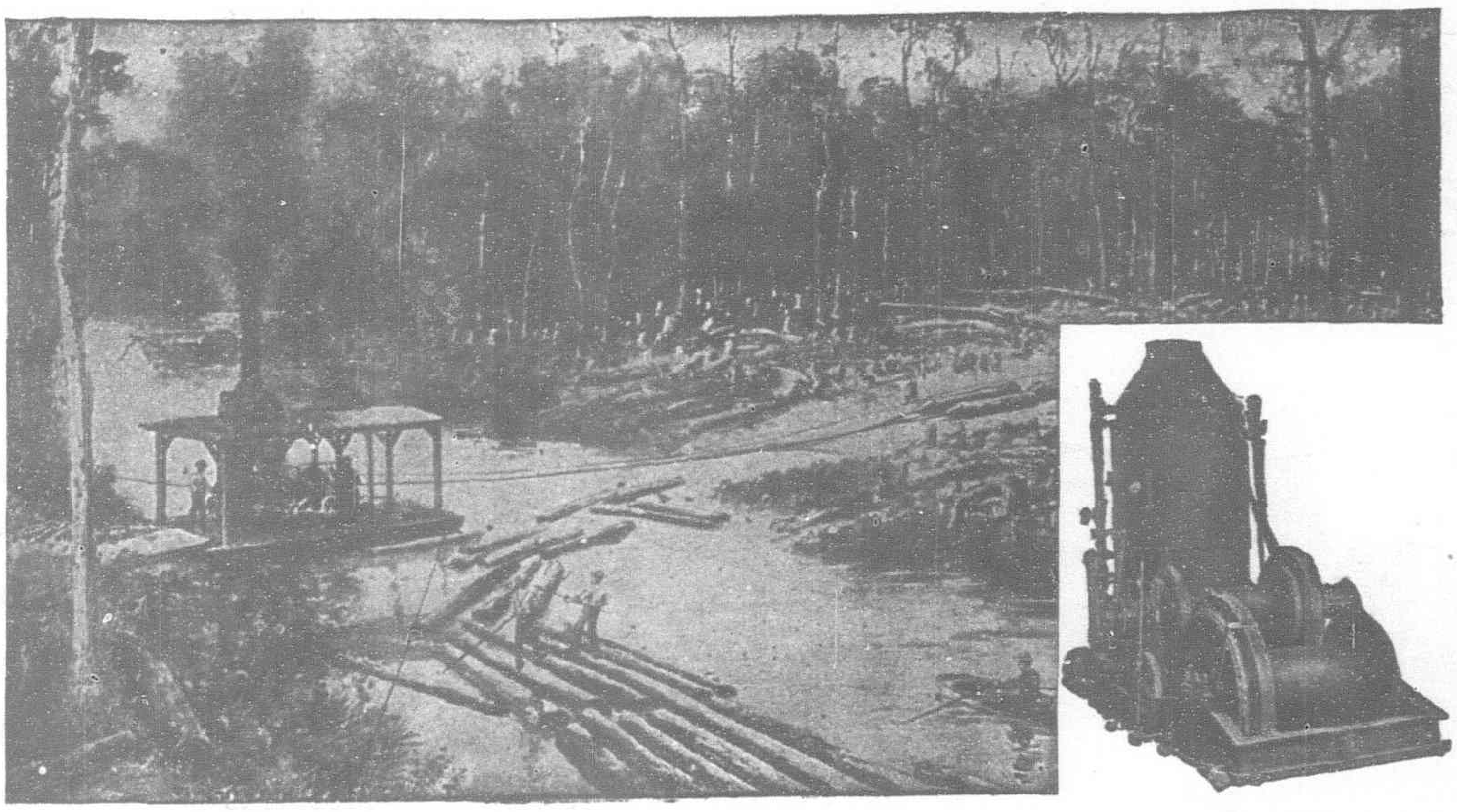

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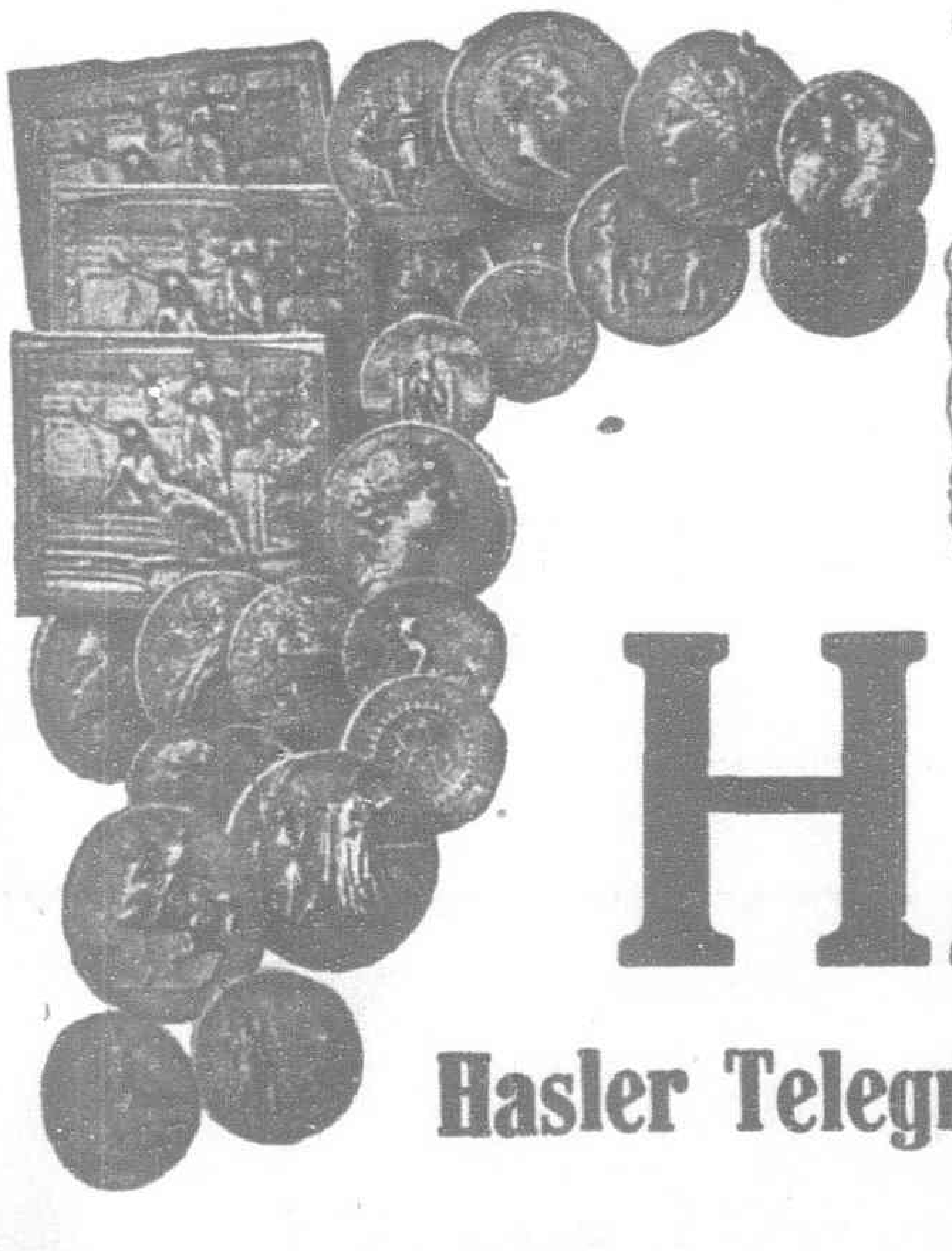

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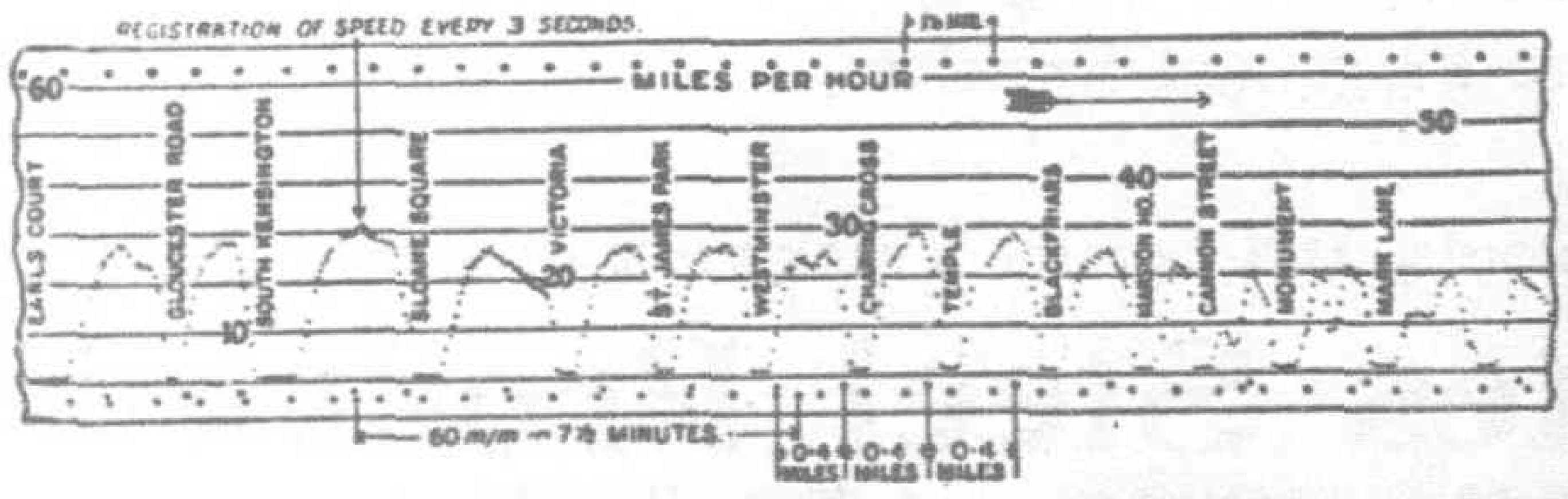

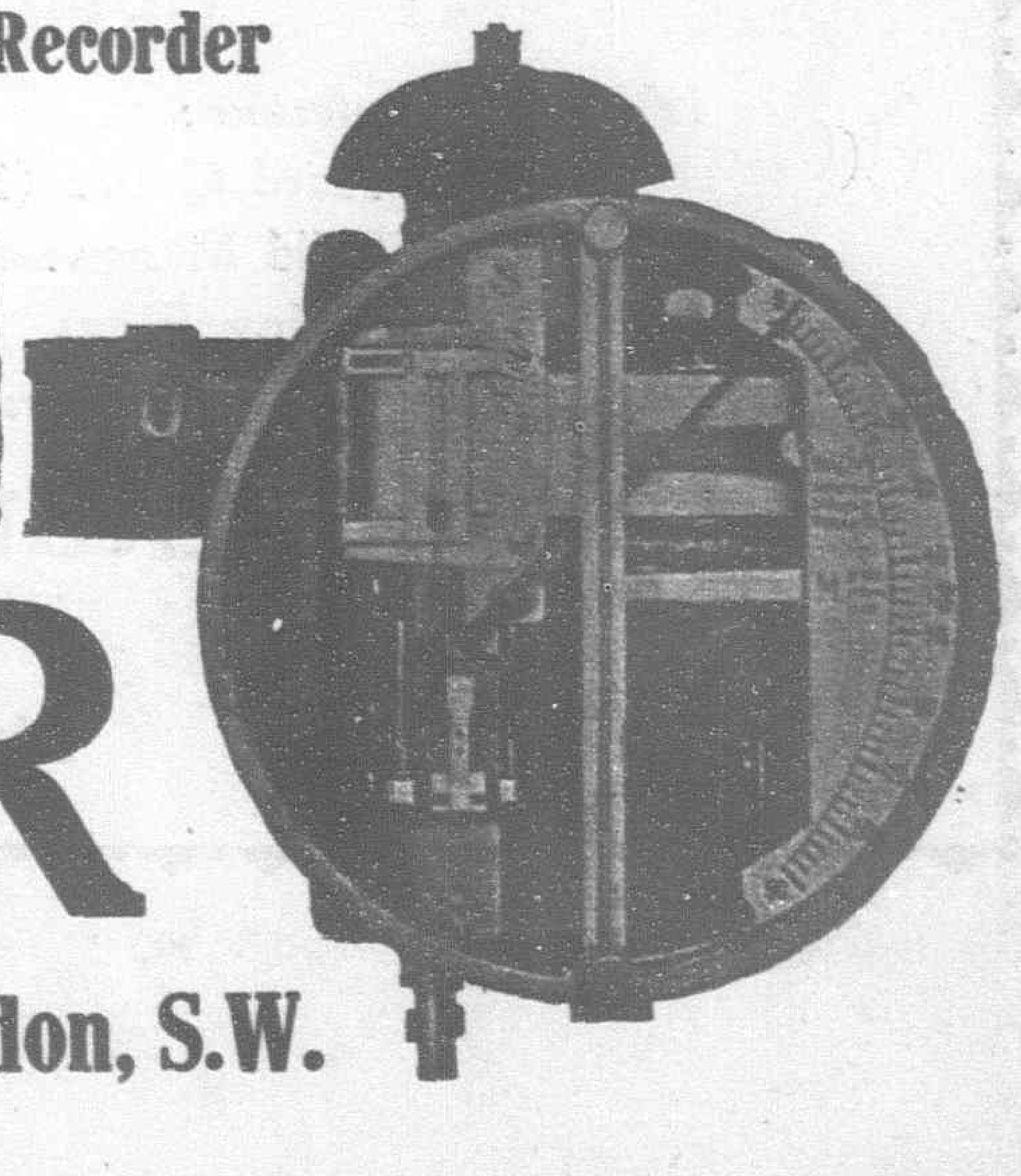

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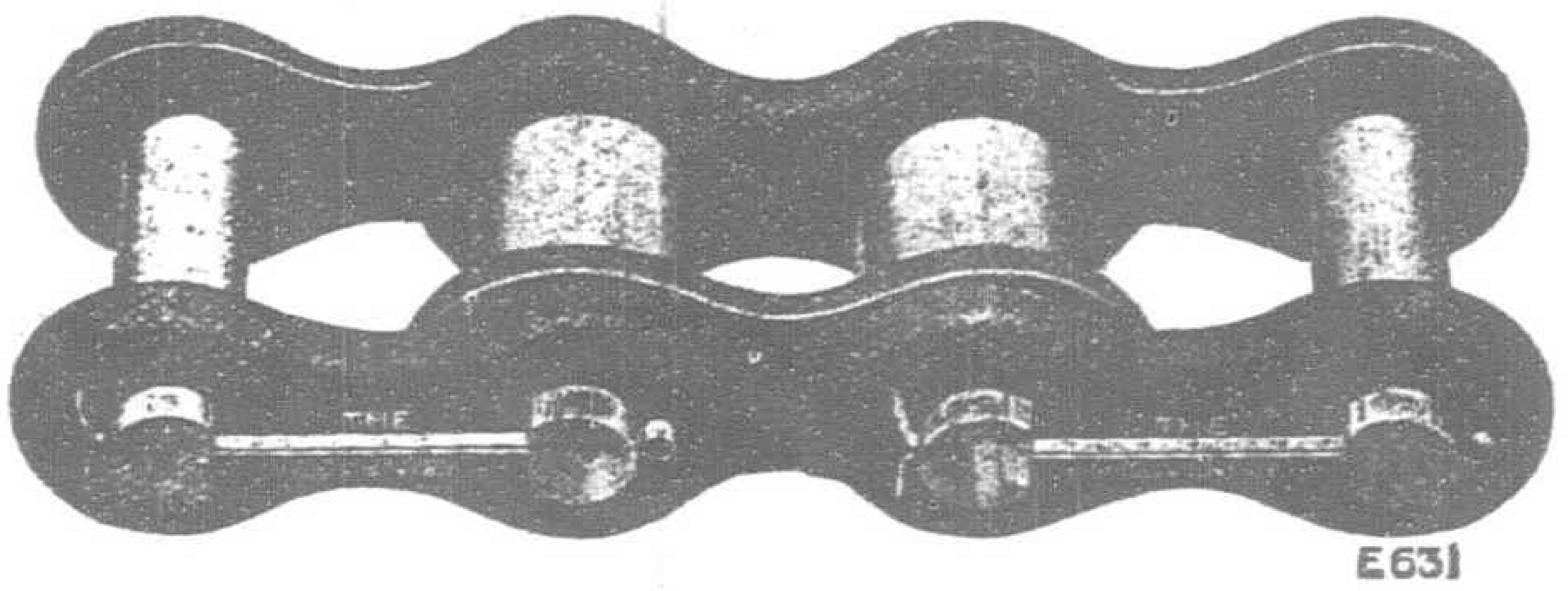

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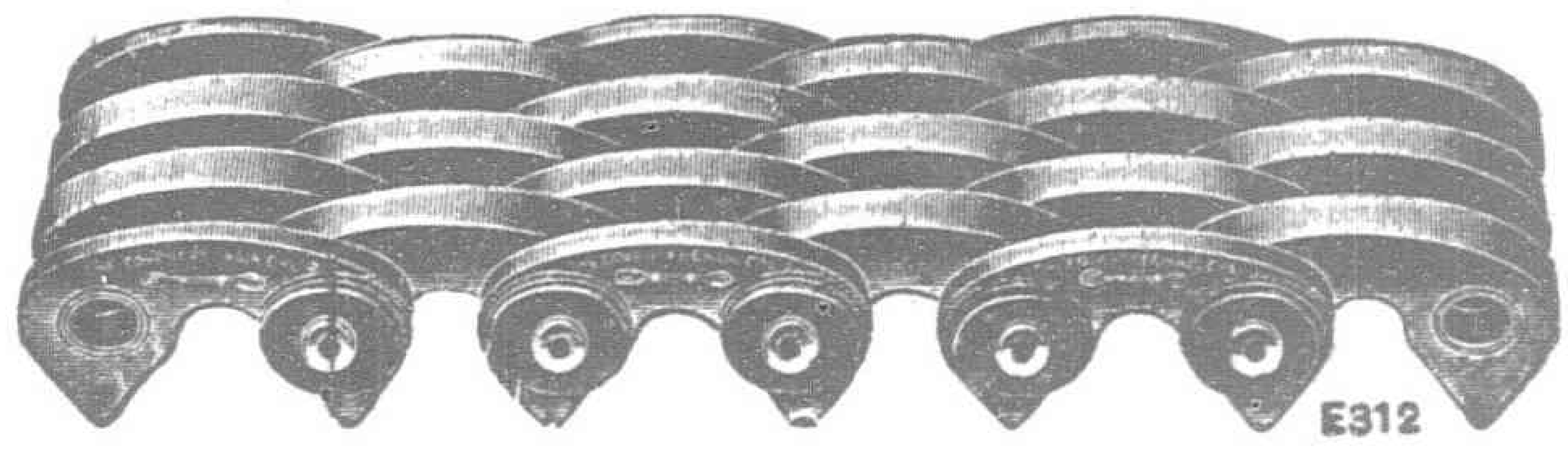

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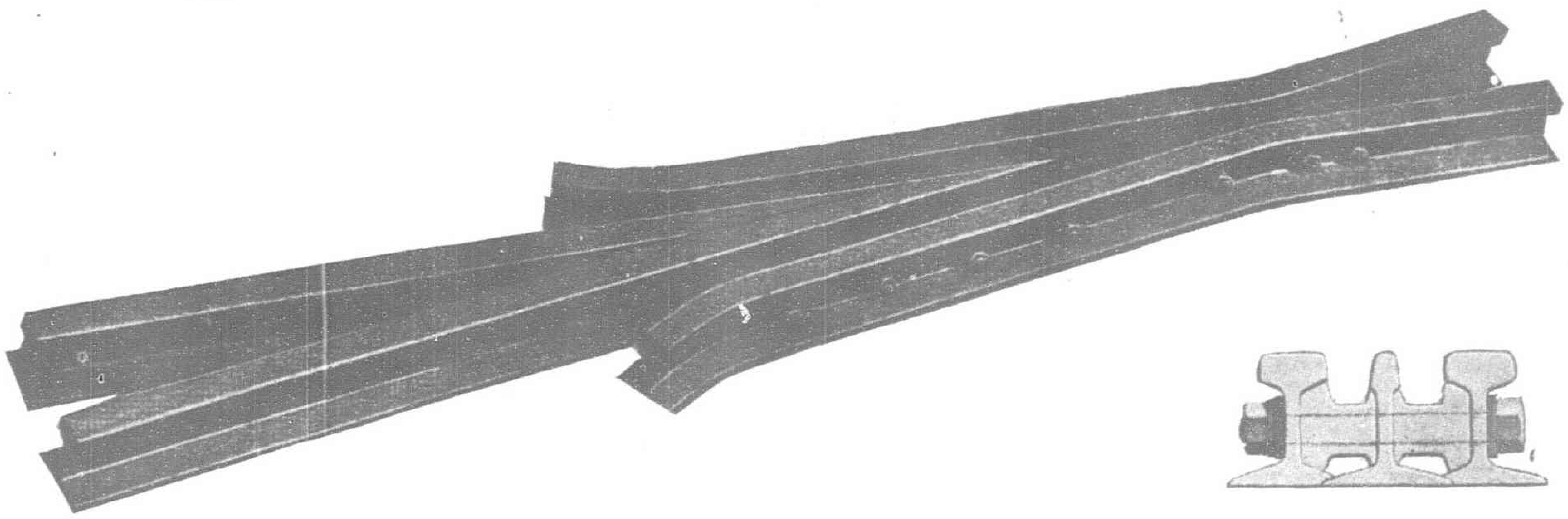

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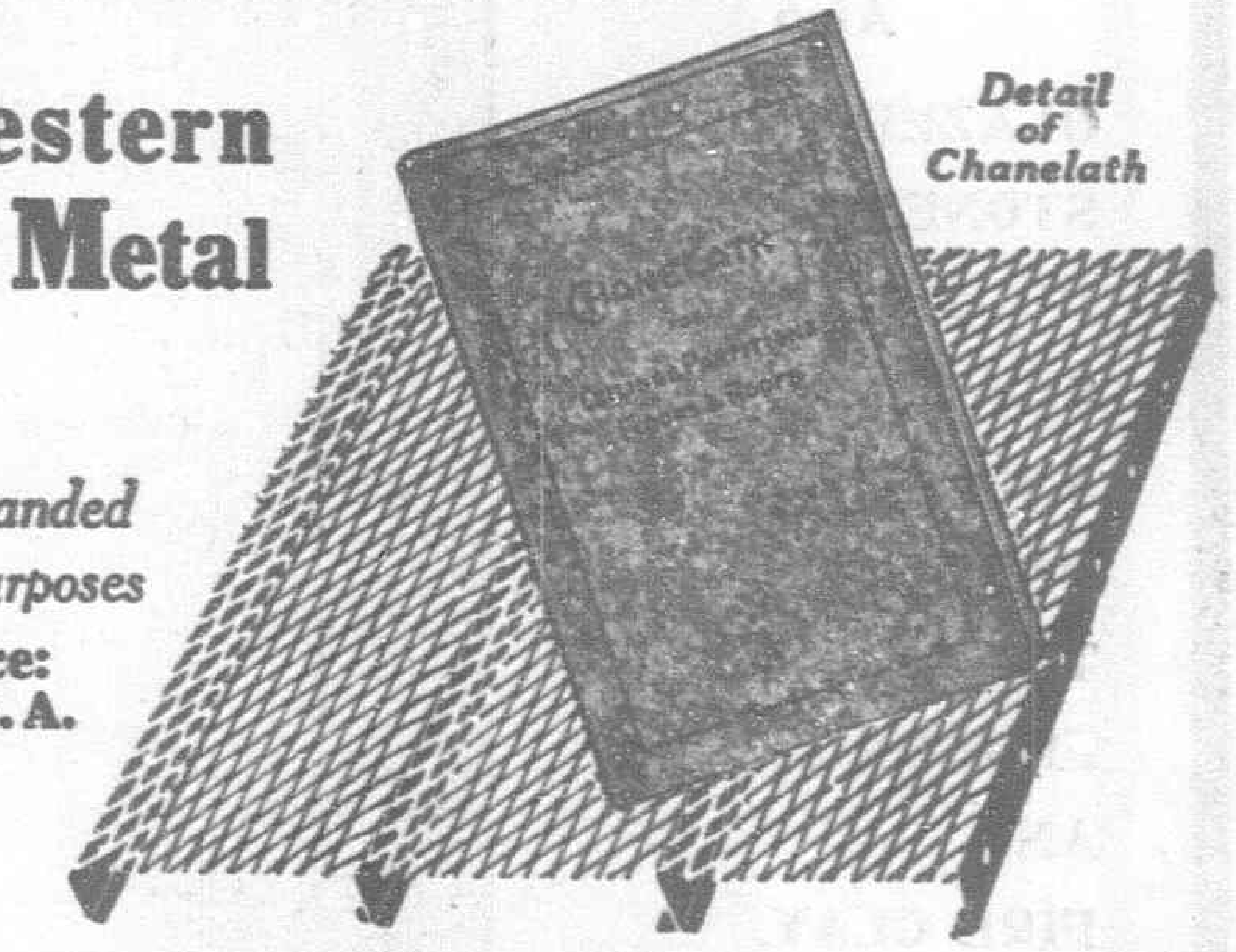

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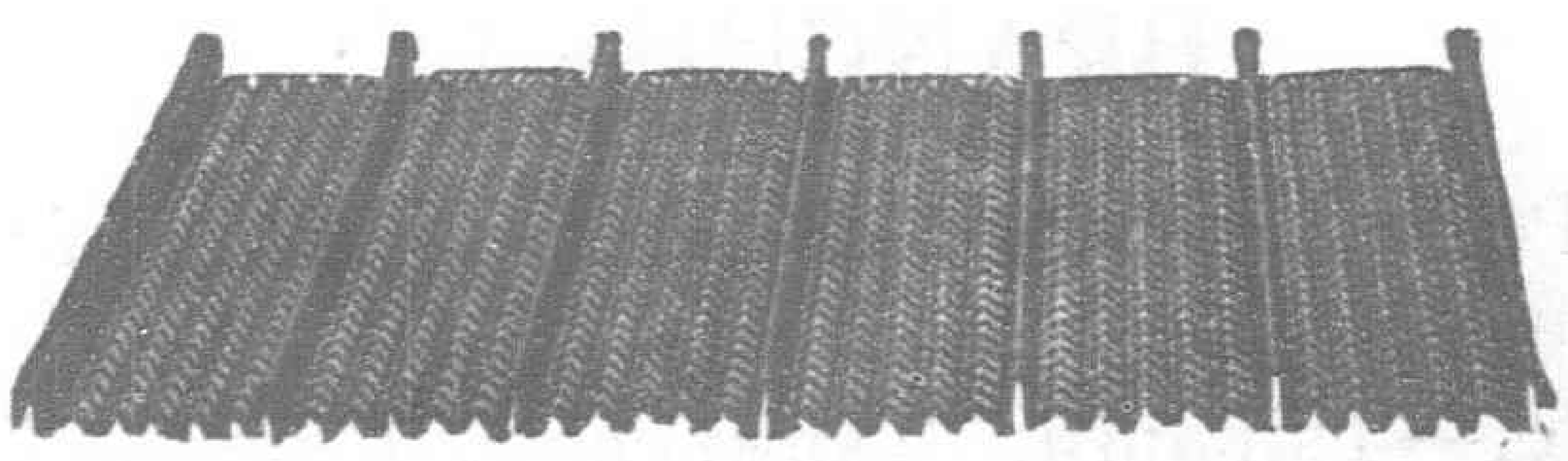

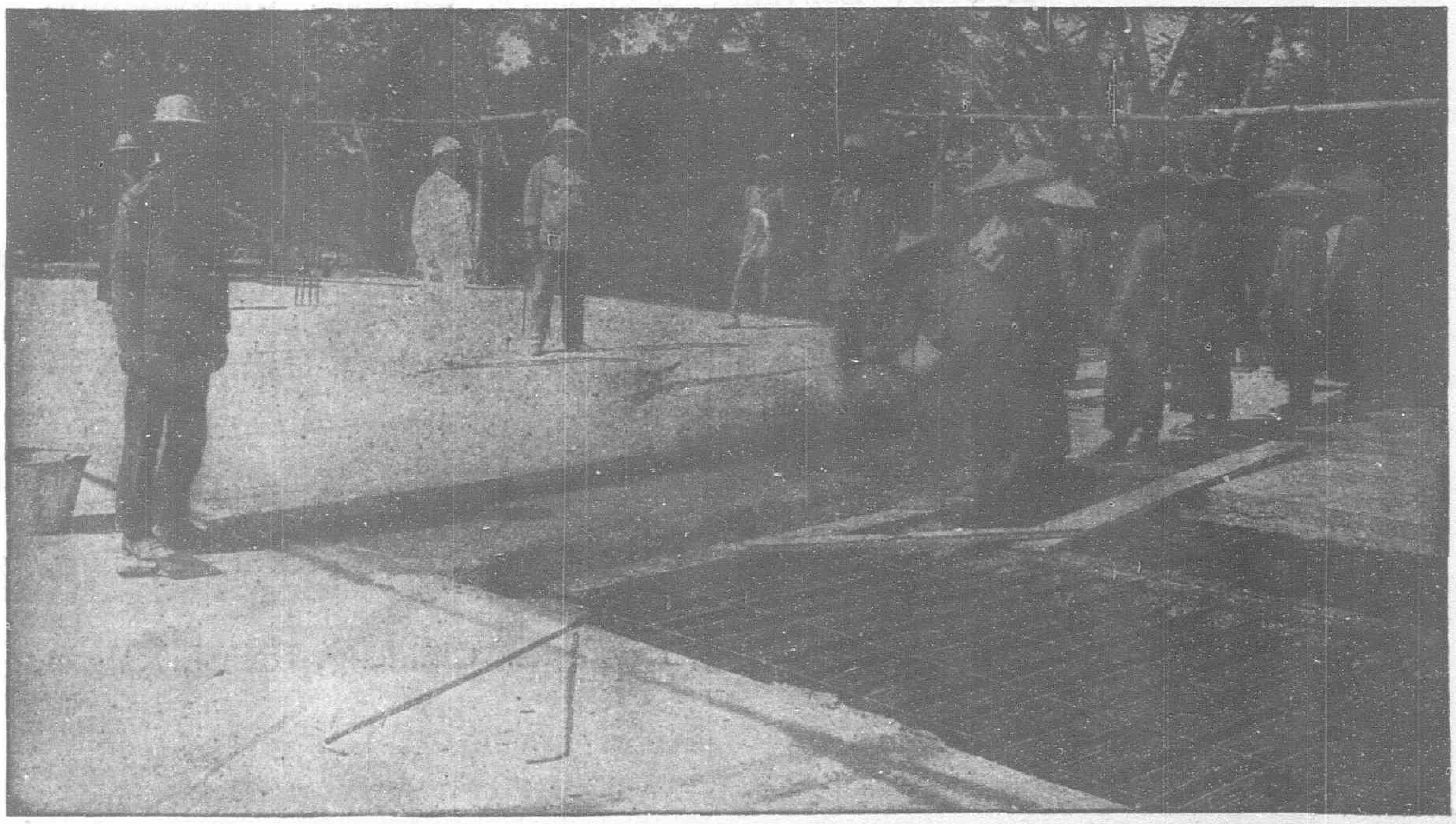

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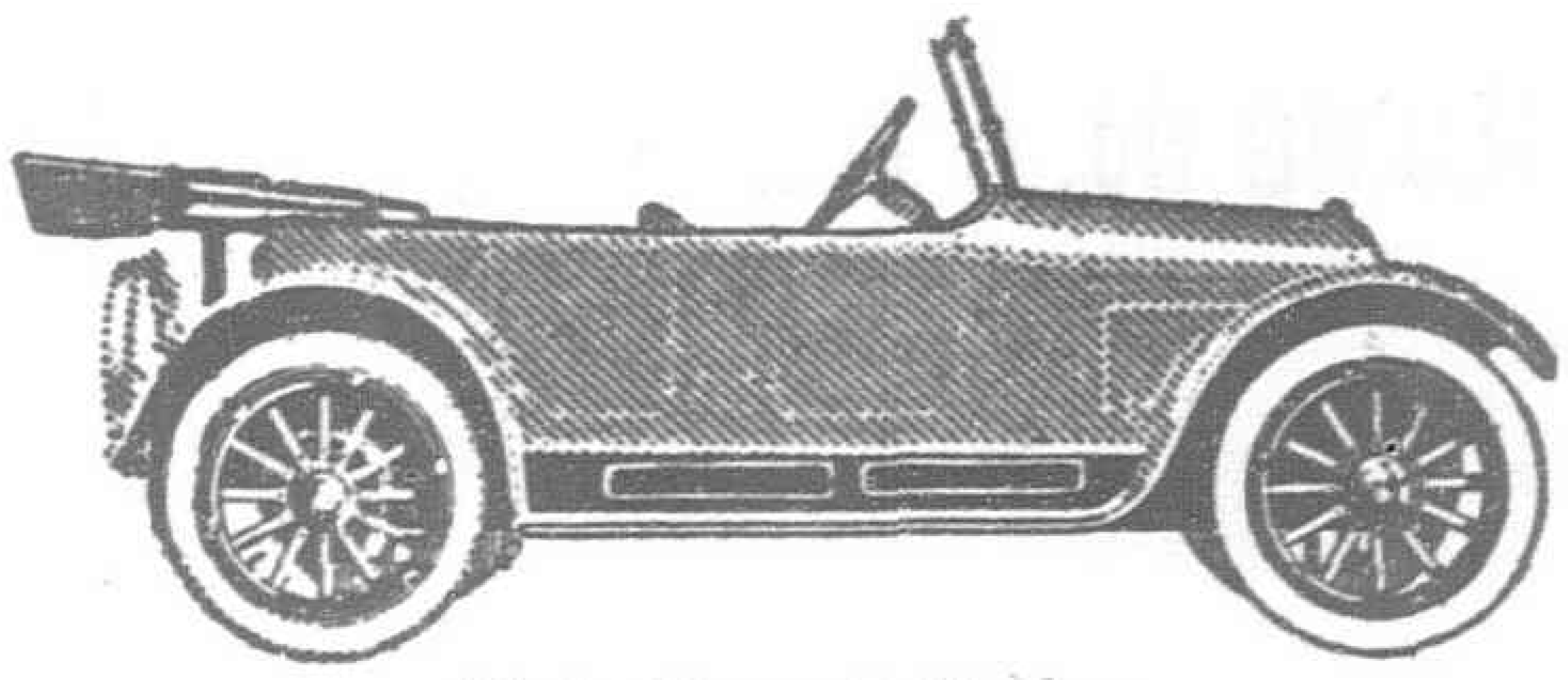
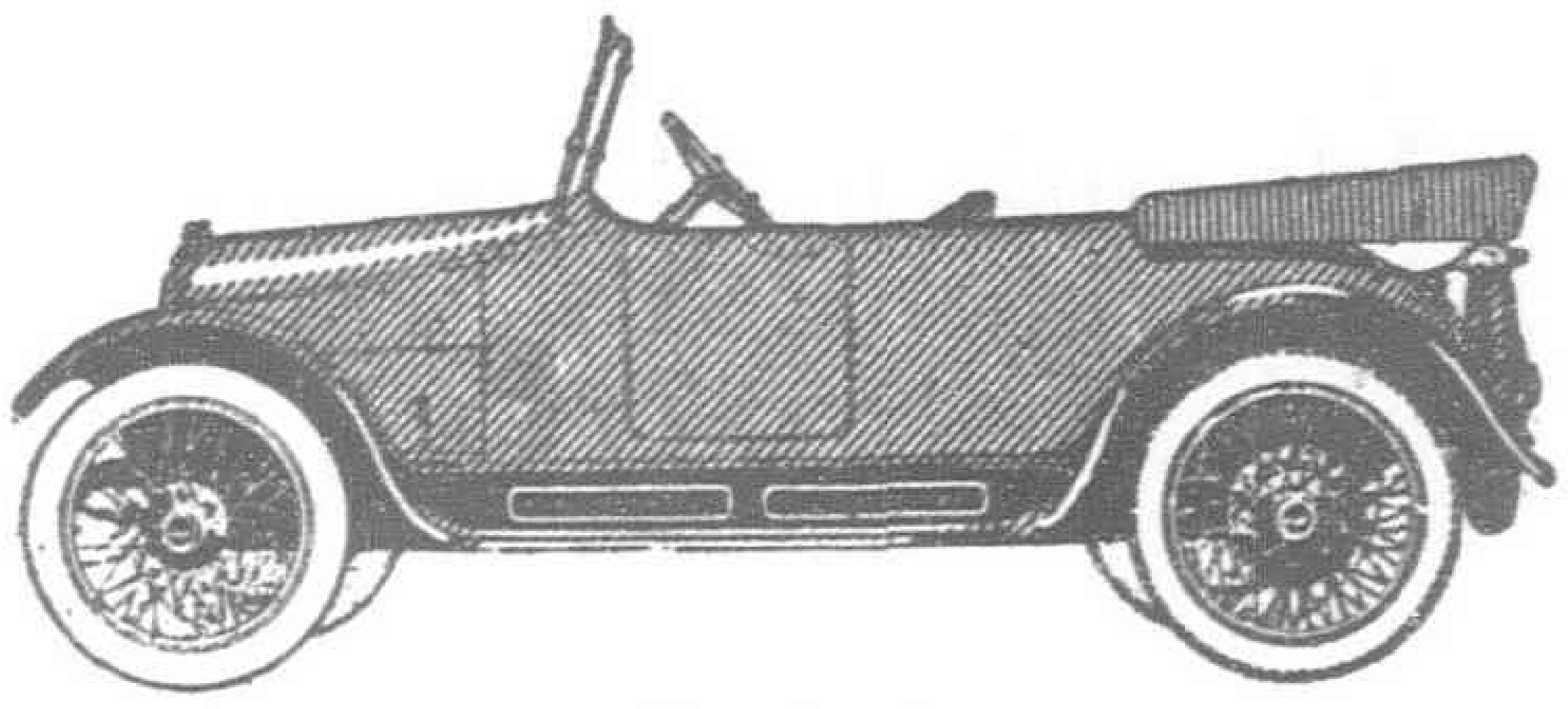
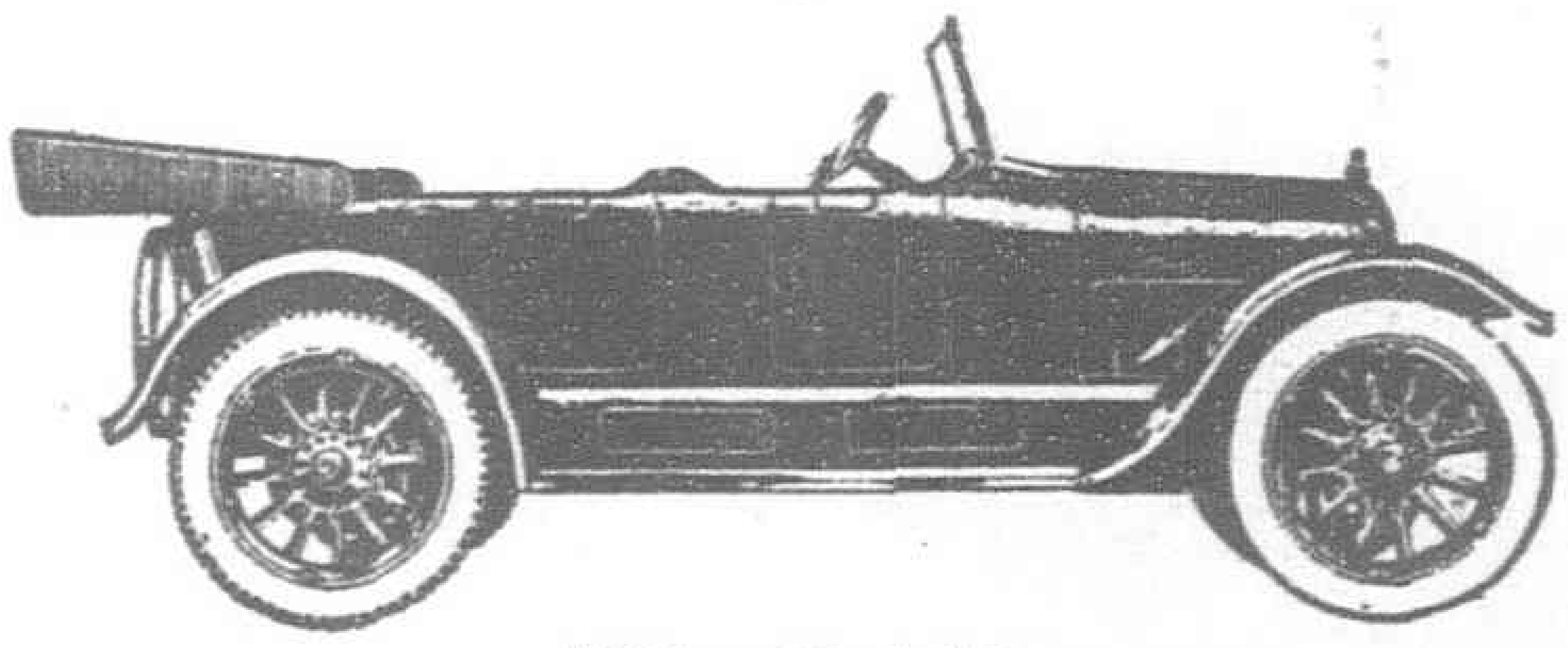


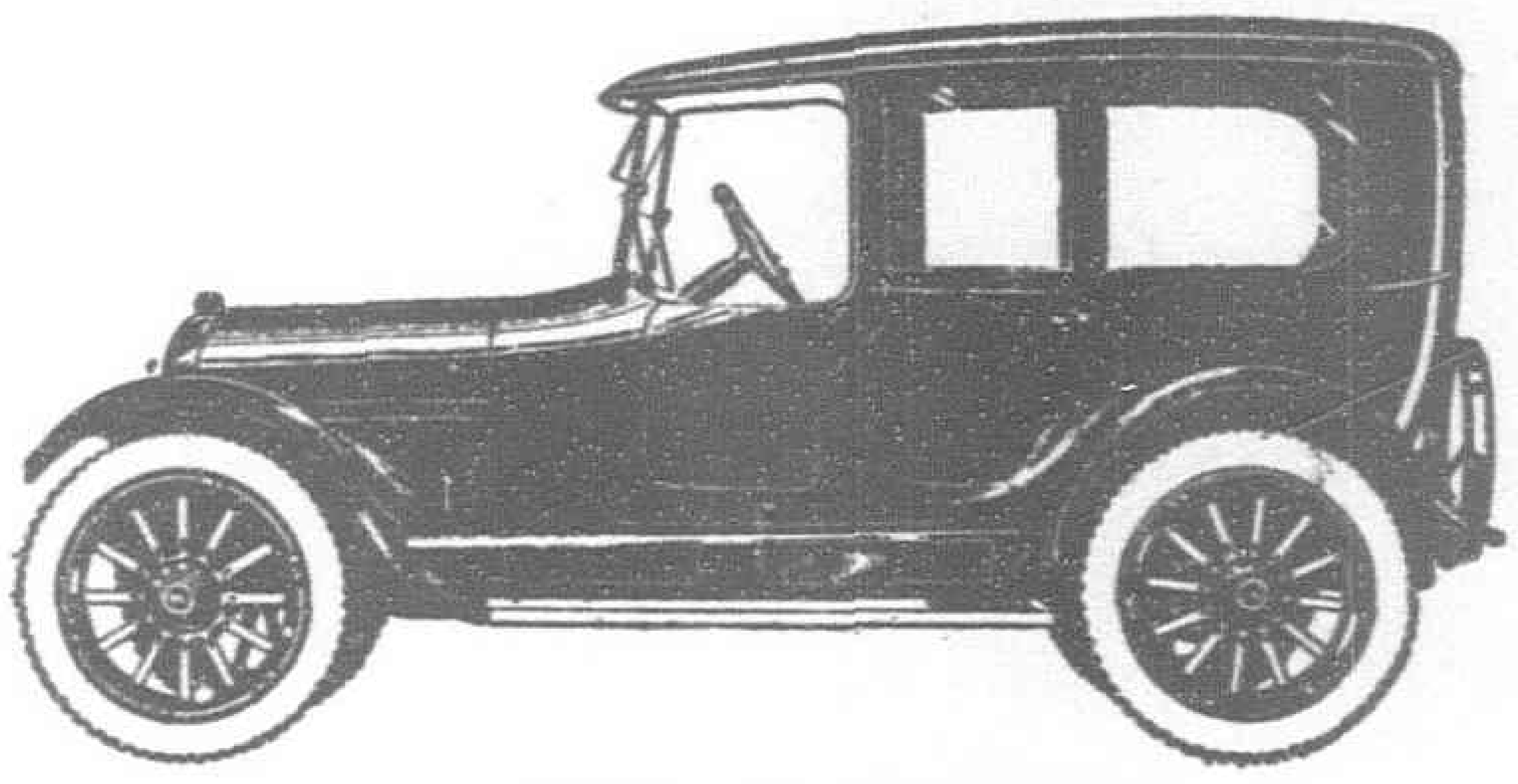
Light Four-Cylinder Touring Car



Overland "Country Club"



Willys-Knight Four-Cylinder Touring Car



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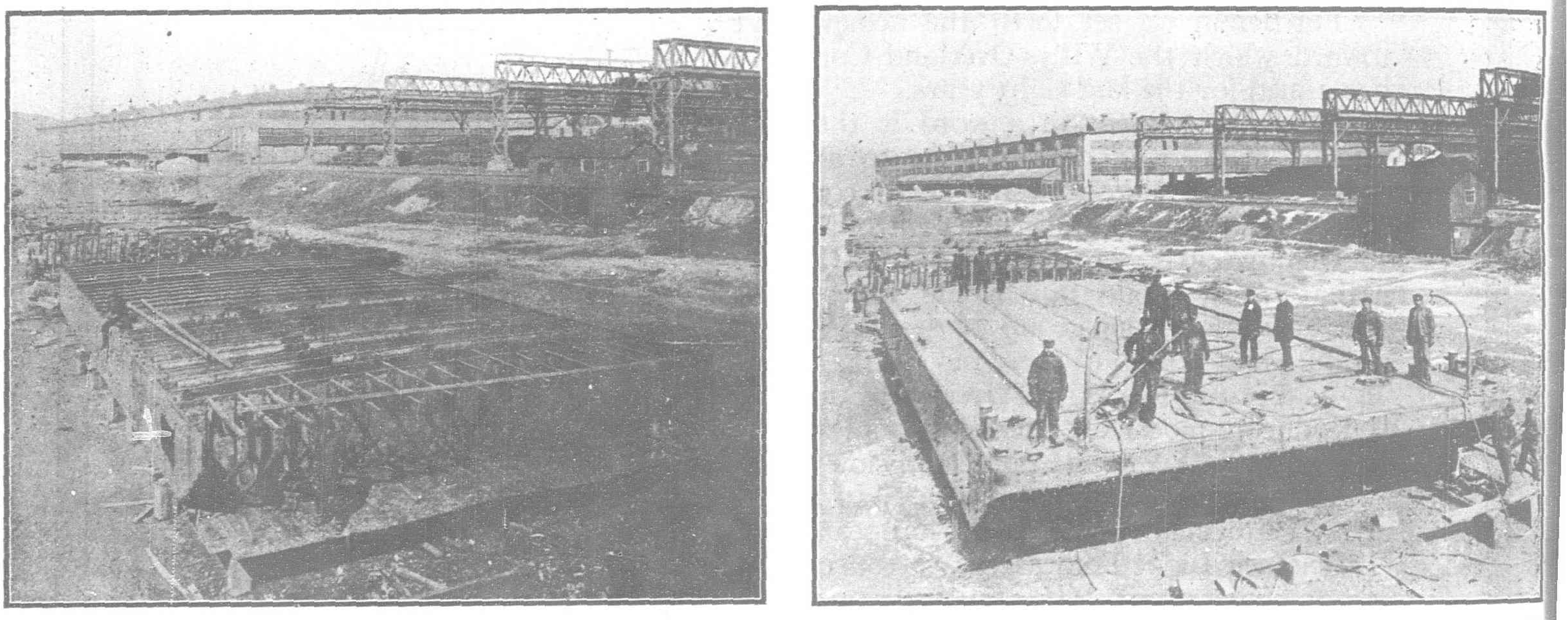

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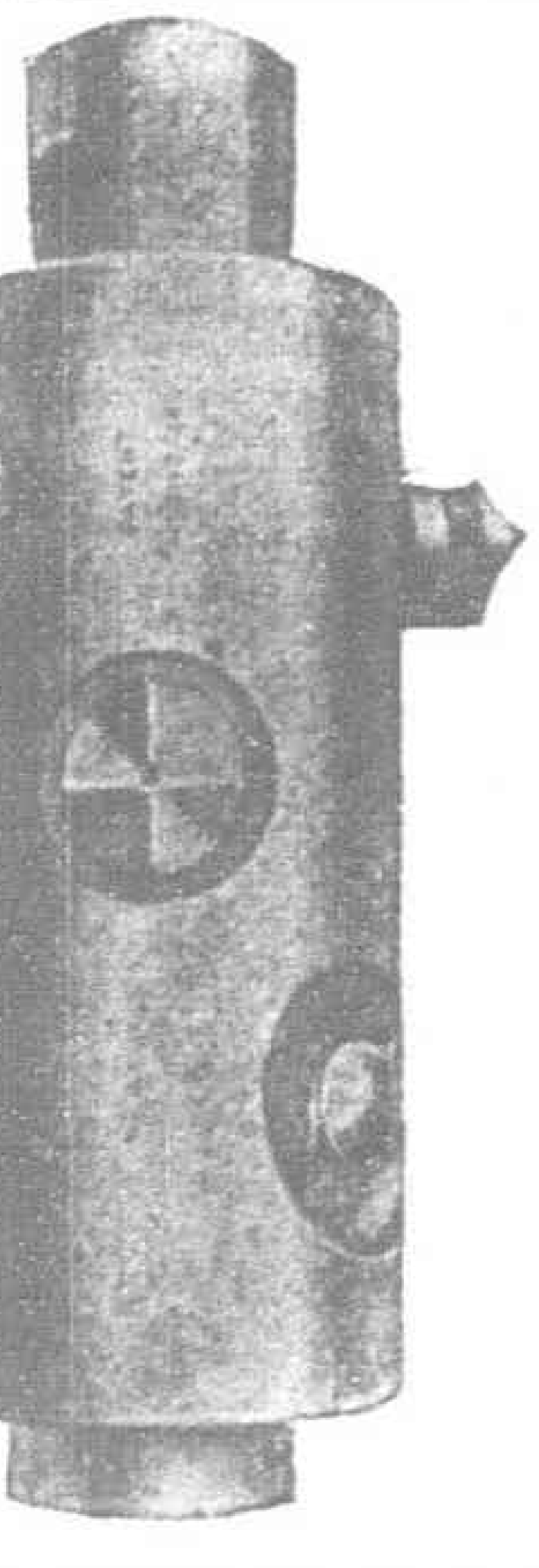

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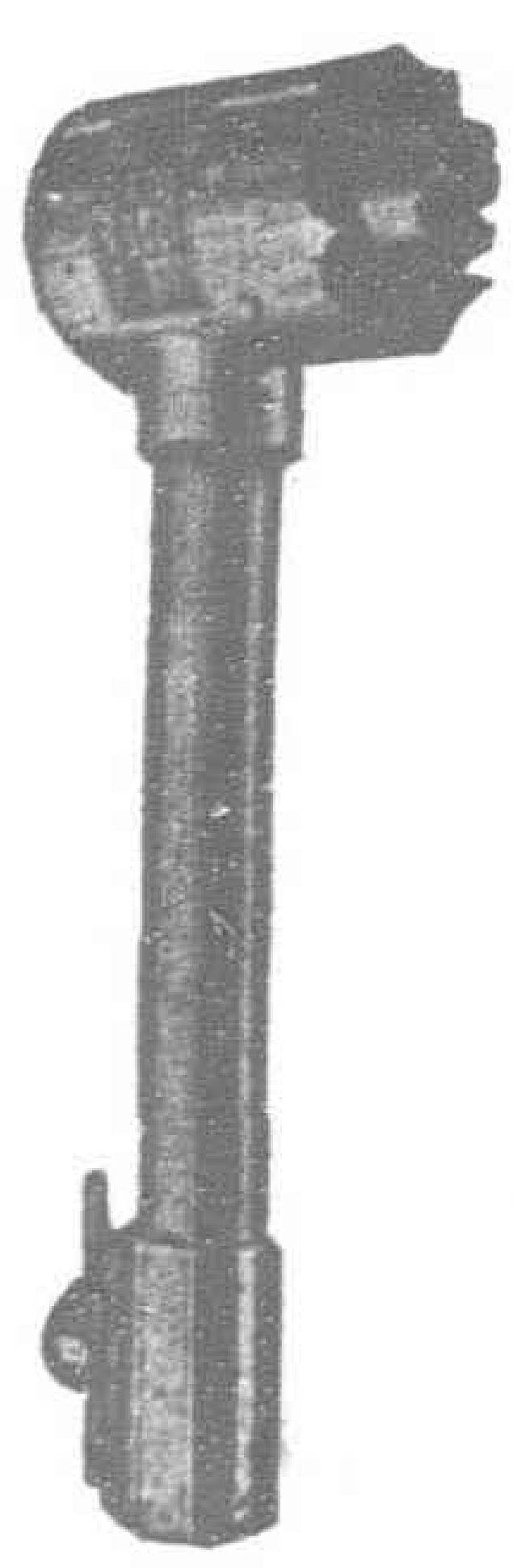

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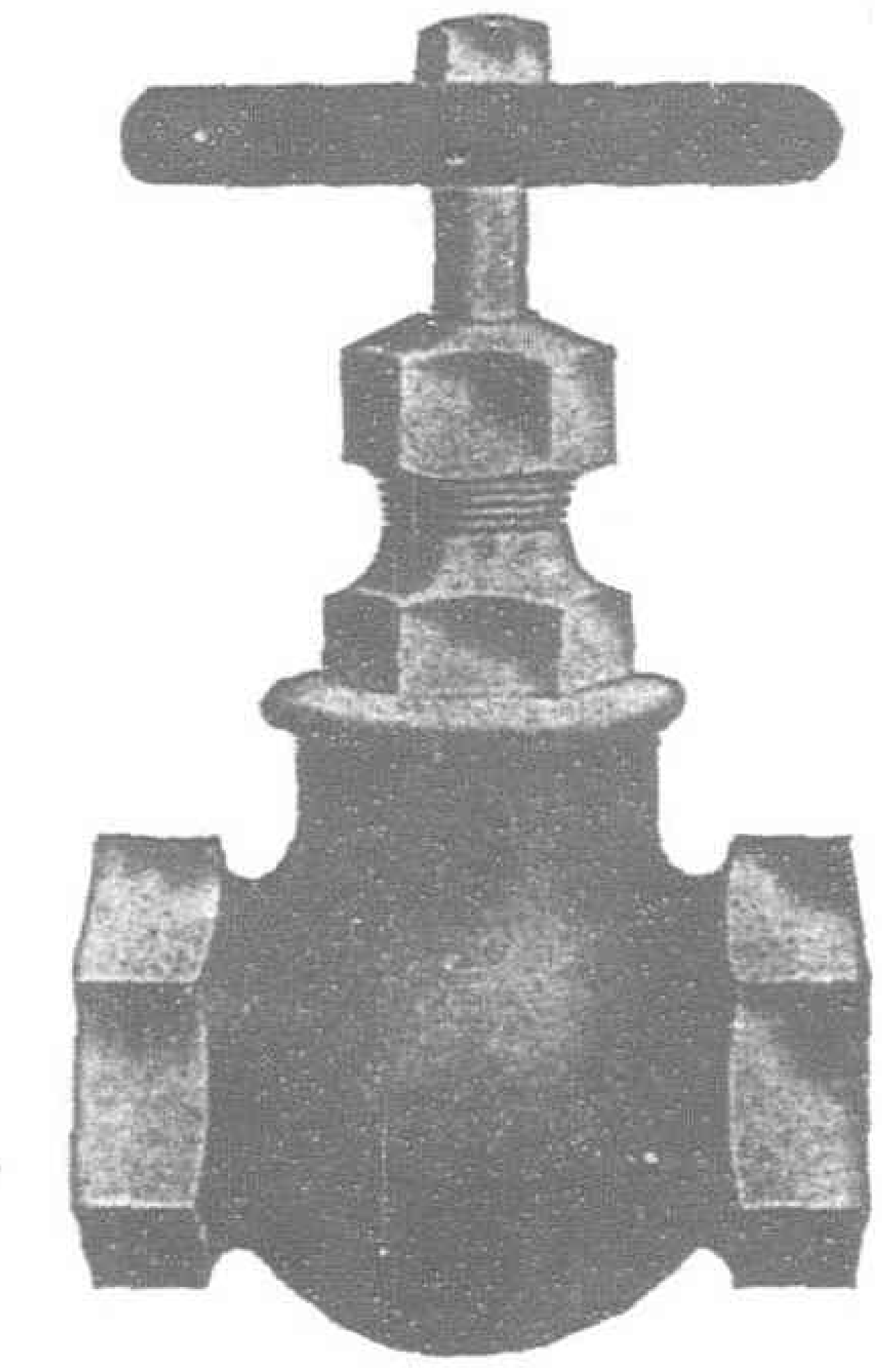

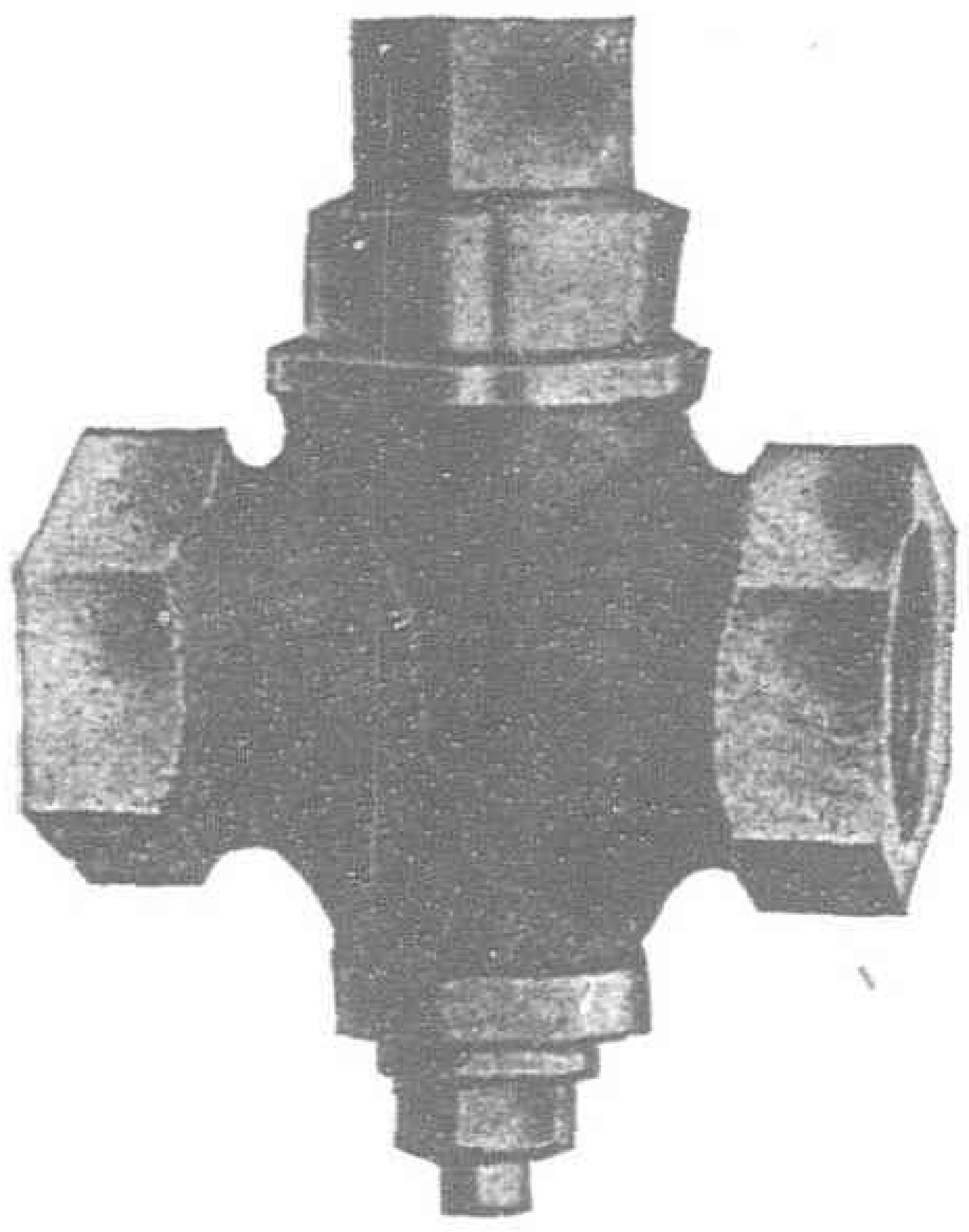

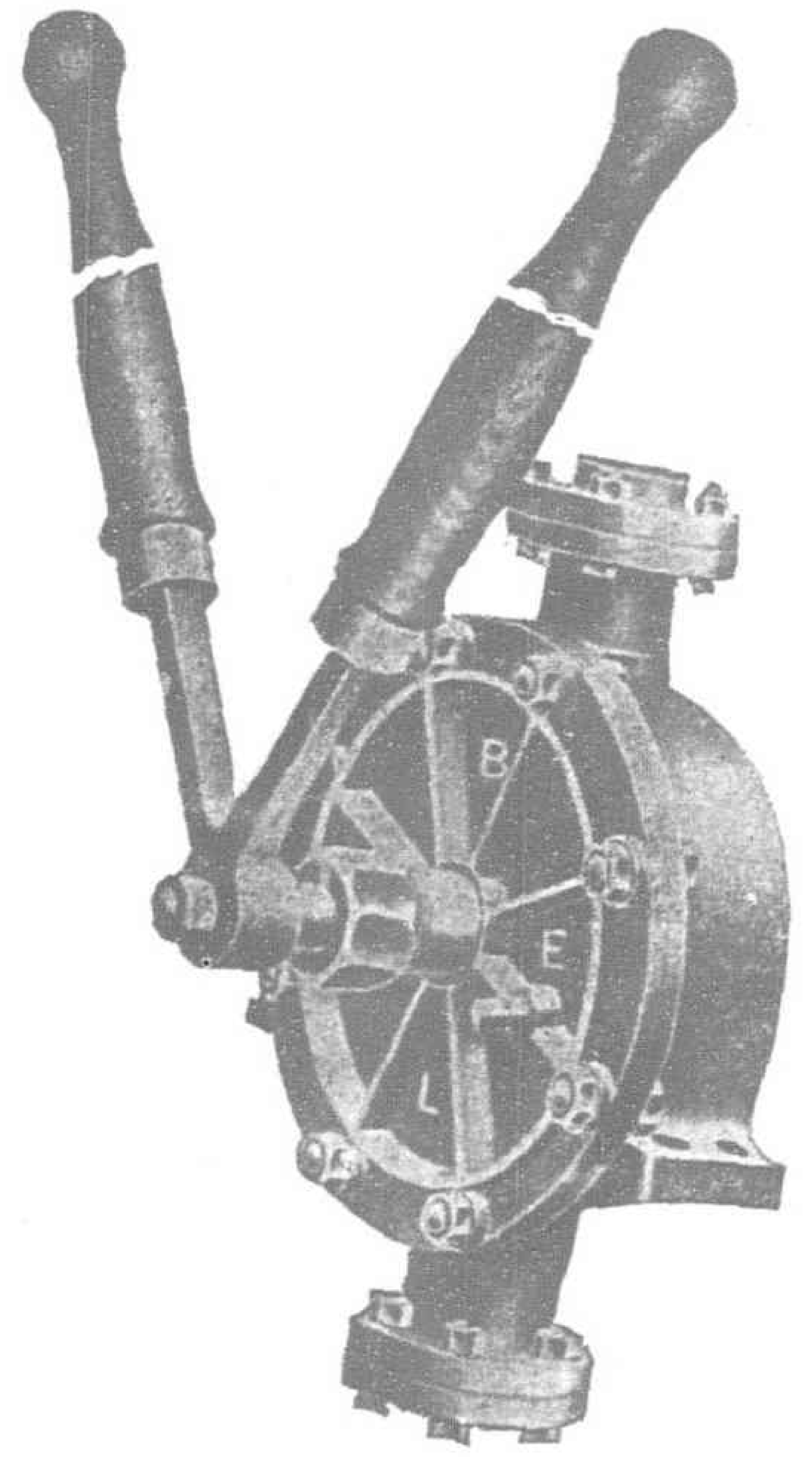

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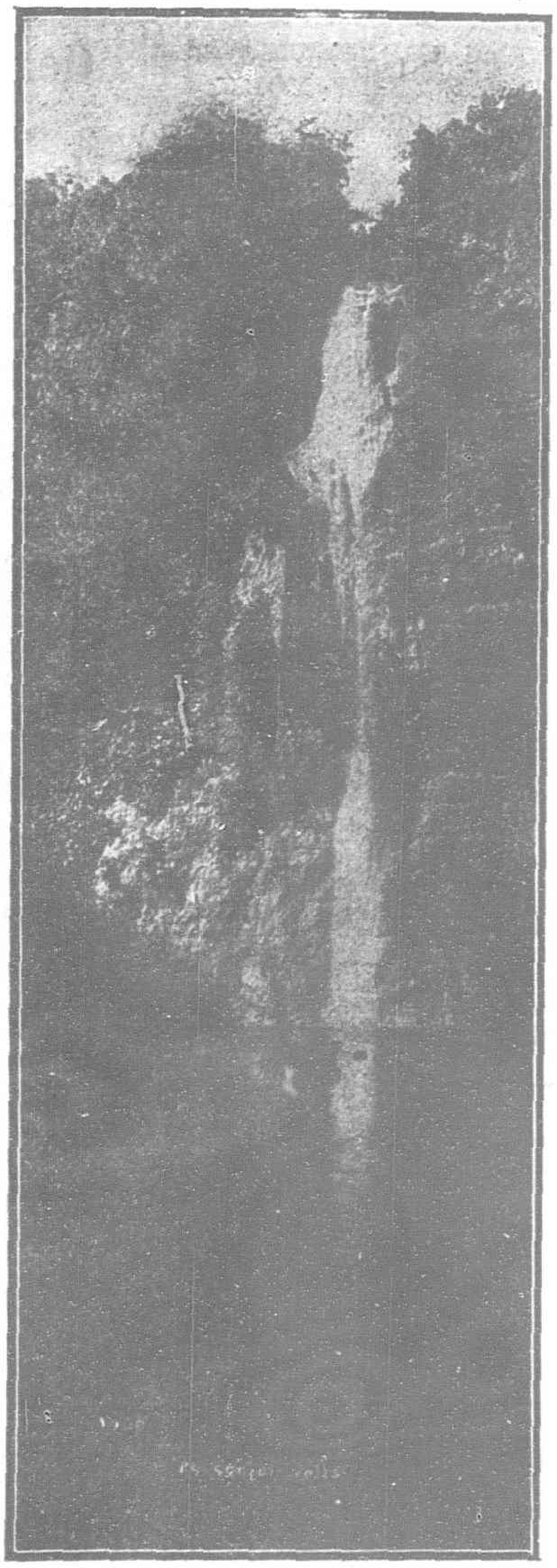

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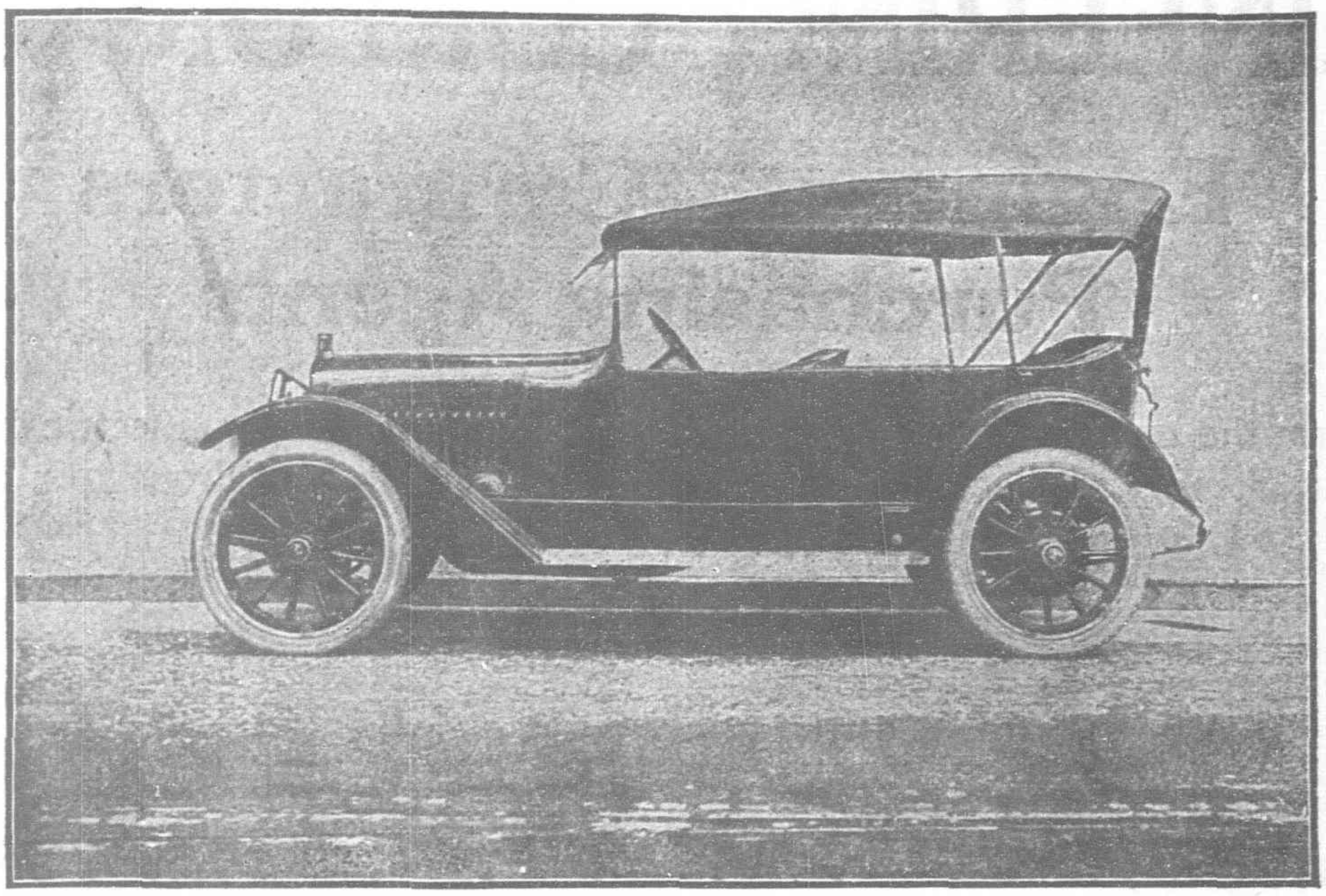

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